

WL-TR-96-4121

BIBLIOGRAPHY ON KTP ISOMORPHS



NILS C. FERNELIUS

JANUARY 1997

FINAL REPORT FOR 06/01/93-11/12/96

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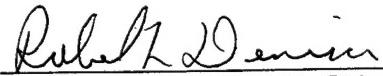
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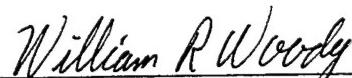
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1. AGENCY USE ONLY (Leave blank)			2. REPORT DATE JAN 1997		3. REPORT TYPE AND DATES COVERED 06/01/93 - 12/31/96		
4. TITLE AND SUBTITLE BIBLIOGRAPHY ON KTP ISOMORPHS			5. FUNDING NUMBERS PE 61102 PR 2305 TA FO WU PJ				
6. AUTHOR(S) NILS C. FERNELIUS			8. PERFORMING ORGANIZATION REPORT NUMBER WL-TR-96-4121				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) MATERIALS DIRECTORATE WRIGHT LABORATORY AIR FORCE MATERIEL COMMAND WRIGHT PATTERSON AFB OH 45433-7734			9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) MATERIALS DIRECTORATE WRIGHT LABORATORY AIR FORCE MATERIEL COMMAND WRIGHT PATTERSON AFB OH 45433-7734 POC: NILS FERNELIUS, WL/MLPO, (937) 255-4474, x3217				
11. SUPPLEMENTARY NOTES					10. SPONSORING/MONITORING AGENCY REPORT NUMBER WL-TR-96-4121		
12a. DISTRIBUTION / AVAILABILITY STATEMENT APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED					12b. DISTRIBUTION CODE		
13. ABSTRACT (Maximum 200 words) <p>This report lists papers of isomorphs of KTiOPO_4 (KTP), i.e., papers on compounds of the form MTiOXO_4 where $\text{M}=\text{K}, \text{Cs}, \text{Rb}, \text{Tl}$ and $\text{X}=\text{P}, \text{As}$. Separate special bibliographies are given for nonlinear optics (NLO) uses of KTP isomorphs, for KTA(KTiOAsO_4), RTA (RbTiOAs_4), and CTA(CsTiOAsO_4).</p>							
14. SUBJECT TERMS KTP isomorphs, rubidium titanyl phosphate, RbTiOPO_4 , RTP, potassium titanyl arsenate, KTiOAsO_4 , KTA, rubidium titanyl arsenate, RbTiOAsO_4 , RTA, Cesium titanyl arsenate, CsTiOAsO_4 , CTA					15. NUMBER OF PAGES 69		
					16. PRICE CODE		
17. SECURITY CLASSIFICATION OF REPORT UL		18. SECURITY CLASSIFICATION OF THIS PAGE UL		19. SECURITY CLASSIFICATION OF ABSTRACT UL		20. LIMITATION OF ABSTRACT UL	

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BIBLIOGRAPHY ON KTP ISOMORPHS

1. INTRODUCTION

The Nd:YAG laser is currently the most popular solid state laser on the market. Its most intense lasing wavelength is at 1.064 μm . To obtain a visible output, a nonlinear optical (NLO) crystal is used to yield a 532 nm line by second harmonic generation (SHG). At the moment, potassium titanyl phosphate, KTiOPO_4 (KTP), is used to obtain the SHG in most new systems. Since KTP has been so successful a NLO crystal, it was thought that some of its relatives or isomorphs might be good candidates for new NLO crystals having better properties for some niche applications.

The general chemical formula is MTiOXO_4 where $\text{M} = \text{K}, \text{Cs}, \text{Rb}$, Ti and $\text{X} = \text{P}, \text{As}$. Since we are interested in making optical parametric oscillators (OPOs) that have outputs in the 3-5 μm wavelength range (an atmospheric window), most of our efforts have been with $\text{X} = \text{As}$ since PO_4 becomes opaque around 4 μm .

The Materials Directorate of Wright Laboratory has issued a number of contracts on KTP isomorphs and the grey track problem of KTP. The contract titles and numbers are as follows: "Improved KTP Crystal Growth", F33615-91-C-5645; "Synthesis, Crystal Growth and Characterization of CsTiOAsO_4 for OPO Applications to 5 Microns", F33615-92-C-5947; "Improved Growth of KTP & KTA Crystals", F33615-93-C-5306; "Improved NLO Materials to 5 microns: Growth of CTA, RTA and Mixed Crystals", F33615-93-C-5380; "New Nonlinear Materials for Applications at 2-5 μm ", F33615-94-C-5410, "Improved Materials for Electro-Optic & Nonlinear Optical Applications in the Mid-IR", F33615-95-C-5435; " CsZrOAsO_4 (CZA) and $\text{K}_{1-x}\text{Rb}_x\text{TiOAsO}_4$ (KRTA), New Nonlinear Materials for Laser Application in the 2-5 μm Region", F33615-95-C-5443.

2. NLO REFERENCES WITH KTP ISOMORPHS

References of nonlinear optics uses involving KTP isomorphs are listed in the following bibliography ordered alphabetically by first author. This includes uses such as second harmonic generation, optical parametric oscillators, Sellmeier equation determinations , sum and difference frequency generators, and modulators. As of 31 January 1997, NLO papers comprise 70 of the 194 total.

2.1

NLO BIBLIOGRAPHY

Agostinelli, J. A., M. C. Gupta and J. M. Mir."Frequency conversion in inorganic thin film waveguides by quasi-phase-matching" Eastman Kodak Co., USA. (CA 121:69079 patent).

Bosenberg, W. R., L. K. Cheng and J. D. Bierlein."Optical parametric frequency conversion properties of KTiOAsO_4 (KTA)" 154-5. **OSA Proc. Adv. Solid-State Lasers.** A. A. Pinto and T. Y. Fan. OSA. (1993).**15**.

Bosenberg, W. R., L. K. Cheng and J. D. Bierlein. (1994). "Optical parametric frequency conversion properties of KTiOAsO_4 ." **Appl. Phys. Lett.** **65** (22) 2765-2767

Boulanger, B., G. Marnier, B. Menaert, X. Cabirol, J. P. Feve, C. Bonnin and P. Villevial. (1993). "Collinear L.C. type II phase-matching for SHG in KTiOAsO_4 : Demonstration of its impossibility at 1.064 μm and first experiment at 1.32 μm . Comparison with KTiOPO_4 ." **Mol. Cryst. Liq. Cryst. Sci. Technol. Sec. B: Nonlinear Optics, Principles, Materials, Phenomena and Devices.** **4** 133-142

Cheng, L. T., L. K. Cheng, J. D. Bierlein and F. C. Zumsteg. (1993). "Nonlinear optical and electro-optical properties of single crystal CsTiOAsO_4 ." **Appl. Phys. Lett.** **63** 2618-2620

Cheng, L. K. and J. D. Bierlein. (1993). "KTP and Isomorphs - Recent Progress in Device and Material Development." **Ferroelectrics.** **142** 209-228

Cheng, L.-T., L. K. Cheng and J. D. Bierlein."Linear and nonlinear optical properties of the arsenate isomorphs of KTP" 43-53. **Growth, Characterization, and Applications of Laser Host and Nonlinear Crystals II.** B. H. T. Chai. Los Angeles, CA 17-18 January 1993.SPIE. (1993).SPIE Proceedings.**1863**.

Cheng, L. K., L. T. Cheng, J. Bierlein and R. Harlow."Frequency-agile materials for visible and near IR frequency conversion" 456-458. **1994 IEEE Nonlinear Optics: Materials, Fundamentals, and Applications.** Waikoloa, Hawaii 25-29 July 1994.IEEE. (1994).

Cheng, L. K., L. T. Cheng, J. Bierlein and R. Harlow. (1994). "Blue light

generation using bulk single crystals of niobium-doped KTiOPO_4 ." Appl. Phys. Lett. **64** (2) 155-157

Cheng, L. K., L. T. Cheng, J. D. Bierlein and J. Parise. (1994). "Phase-matching property optimization using birefringence tuning in solid solutions of KTiOPO_4 isomorphs." Appl. Phys. Lett. **64** (11) 1321-1323

Chuang, T., J. Kaskinski and H. R. Verdun."A KTA optical parametric oscillator pumped by a Q-switched, injection-seeded Nd:YAG laser" 150-154. **OSA Trends in Optics and Photonics on Advanced Solid State Lasers.** S. A. Payne and C. R. Pollock. San Francisco, CA, 31 Jan-2 Feb 1996.OSA. (1996).1.

Ebbers, C. A. (1995). "Thermally insensitive, single-crystal, biaxial electro-optic modulators." J. Optical Soc. Am. B. **12** (6) 1012-1020

Ebbers, C. A. and S. P. Velsko."Optical and thermo-optical characterization of KTP and its isomorphs for 1.06 μm pumped OPO's" 227-239. **Nonlinear Frequency Generation and Conversion.** M. C. Gupta, W. J. Kozlovsky and D. C. MacPherson. San Jose, CA, 29-31 Jan. 1996.SPIE. (1996).2700.

El-Brahimi, M. and J. Durand. (1986). "Structure et properties d'optique non lineaire de KTiOAsO_4 ." Revue de Chimie Minerale. **23** 146-153

El-Haidouri, A., J. Durand and L. Cot. (1990). "Correlation entre structure et generation de second harmonique dans les composes $\text{M}^{\text{I}}\text{TiOAsO}_4$ - Correlation between structure and second harmonic generation in $\text{M}^{\text{I}}\text{TiOAsO}_4$." Mat. Res. Bull. **25** 1193-1202

Fei, S., H. L. Strauss and A. H. Kung. (1995). "Mid-infrared generation using KTiOAsO_4 ." Bull. Am. Phys.. Soc. **40** (1) 366

Fenimore, D. L. and K. L. Schepler."Three-wave nonlinear interactions in KTiOPO_4 (KTP) and KTP isomorphs" September 1993.Wright Laboratory Solid State Electronics Directorate, WL-TR-93-5029. (1993).

Fenimore, D. L., K. L. Schepler and U. B. Ramabadran."Improved Sellmeier coefficients for potassium titanyl arsenate, KTiOAsO_4 (KTA)" 96. **OSA**

Annual Meeting, 2-7 October 1994. O. S. o. America. Dallas, TX.Paper TuW4. (1994).**1994 OSA Annual Meeting Program.**

Fenimore, D. L., K. L. Schepler, U. B. Ramabadran and S. R. McPherson. (1995). "Infrared corrected Sellmeier coefficients for potassium titanyl arsenate." *J. Opt. Soc. Am. B.* **12** (5) 794-796

Fenimore, D., K. L. Schepler and S. Kueck."Difference frequency generation in rubidium titanyl arsenate (RTA)" Paper CG-10. **The Ohio Section/American Physical Society.** Univ. of Dayton, Dayton, Ohio, 6-7 Oct 1995.(1995).

Fenimore, D. L., K. L. Schepler, D. Zelmon, S. Kück, U. B. Ramabadran, P. VonRichter and D. Small. (1996). "Rubidium titanyl arsenate difference-frequency generation and validation of new Sellmeier coefficients." *J. Opt. Soc. Am. B.* **13** (9) 1935-1940

Feve, J. P., B. Boulanger, X. Cabirol, N. Menaert, G. Marnier, C. Bonnin and P. Villeval. (1995). "Non-critically phase-matched cascaded THG at 440 nm in $\text{KTiOP}_{1-y}\text{As}_y\text{O}_4$ crystals." *Optics Comm.* **115** 323-326

French, S., M. Ebrahimzadeh and A. Miller."Picosecond optical parametric oscillation in KTiOAsO_4 " CPD47-1-2. **CLEO'95. Summaries of Papers.** O. S. o. America. Baltimore, MD, 22-26 May 1995.OSA. (1995).**15, 1995 Technical Digest Series.**

French, S., M. Ebrahimzadeh and A. Miller. (1996). "High-power, high-repetition-rate picosecond optical parametric oscillator for the near- to mid-infrared." *Optics Lett.* **21** (2) 131-133

French, S., M. Ebrahimzadeh and A. Miller. (1996). "High-power, high-repetition-rate picosecond optical parametric oscillator for the near- to mid-infrared." *J. Modern Optics.* **43** (5) 929-952

Fukumoto, J. M., H. Komine and E. A. Stappaerts."High repetition rate, angle tuned KTiOAsO_4 optical parametric oscillator. Paper WL4" 118. **OSA Annual Meeting, 2-7 October 1994.** O. S. o. America. Dallas, TX.(1994).**Program.**

Furukawa, Y. and F. Nitanda."Poling of ferroelectric single crystals"
Hitachi Metals Ltd, Japan. (CA 121:167543 patent).

Haidouri, A. E., J. Durand and L. Cot. (1990). "Correlation entre structure et
generation de second harmonique dans les composes $M^I\text{TiOAsO}_4$." Mat. Res.
Bull. 25 1193-1202

Hamilton, C. E."Solid-state lasers and nonlinear optical devices for the eye safe
region" 173-4. **CLEO '94. Summaries of Papers Presented at the
Conference on Lasers and Electro-Optics.** Anaheim, CA, 8-13 May
1994.(1994).1994 Technical Digest Series. Conference Edition.8. **1994 Technical
Digest Series. Conference Edition.**

Holtom, G. R., R. A. Crowell and X. S. Xie."Non-critically phase-matched
femtosecond optical parametric oscillator near 3 microns" 407-409.
Advanced Solid-State Lasers. T. Y. Fan and B. H. T. Chai. Salt Lake City,
7-10 February 1994.Optical Society of America. (1994).OSA
Proceedings.20.

Holtom, G. R., R. A. Crowell and L. K. Cheng."Femtosecond OPOs at 3 microns
and beyond: design and performance issues related to the crystal
properties of KTP and similar materials" 219-225. **Solid State Lasers
and Nonlinear Crystals.** G. J. Quarles, L. Esterowitz and L. K. Cheng. San
Jose, CA, 5-7 Feb 1995.SPIE. (1995).SPIE Proceedings.2379.

Holtom, G. R., R. A. Crowell and L. K. Cheng. (1995). "Femtosecond
mid-infrared optical parametric oscillator based on CsTiOAsO_4 ." Optics
Lett. 20 (18) 1880-1882

Isyanova, Y., G. A. Rines, D. Welford and P. F. Moulton."Tandem OPO source
generating 1.5-10 μm wavelengths" 174-176. **OSA Trends in Optics
and Photonics on Advanced Solid State Lasers.** S. A. Payne and C. R.
Pollock. San Francisco, CA, 31 Jan-2 Feb 1996.OSA. (1996).1.

Jacco, J., J. Rottenberg, R. A. Stolzenberger and M. G
Loiacono." CsZrOAsO_4 (CZA) and $K_{1-x}\text{Rb}_x\text{TiOAsO}_4$ (KRTA), New nonlinear
materials for laser application in the 2-5 μm region" January
1996.Crystal Associates, Inc., WL-TR-96-4024. (1996).

Jani, M. G., J. T. Murray, R. R. Petrin, R. C. Powell, D. N. Loiacono and G. M. Loiacono. (1992). "Pump wavelength tuning of optical parametric oscillations and frequency mixing in KTiOAsO_4 ." *Appl. Phys. Lett.* **60** 2327-2329

Jones, R. P."Parametric oscillation in KTP and KTA at 1064 nm" 357-364. **Solid State Lasers and Nonlinear Crystals.** G. J. Quarles, L. Esterowitz and L. K. Cheng. San Jose, CA, 5-7 Feb 1995.SPIE. (1995).SPIE Proceedings.**2379**.

Karlsson, H., F. Laurell, P. Hendricksson and G. Arvidsson. (1996). "Frequency doubling in periodically poled RbTiOAsO_4 ." *Electronics Letters.* **32 (6)** 556-557

Kato, K. (1994). "Second-harmonic and sum-frequency generation in KTiOAsO_4 ." *IEEE J. Quantum Electronics.* **30** 881-883

Kaz, A., R. Burnham, L. R. Marshall and A. Pinto."Non-critically phase-matched, degenerate 4 μm optical parametric oscillator" 443-446. **Advanced Solid-State Lasers.** T. Y. Fan and B. H. T. Fan. Salt Lake City, 7-10 February 1994.Optical Society of America. (1994).OSA Proceedings.**20**.

Kaz, A., L. R. Marshall, A. Pinto and R. Utano."Scaling optical parametric oscillators in power, energy, and beam quality" 466-470. **Advanced Solid-State Lasers.** T. Y. Fan and B. H. T. Chai. Salt Lake City,UT 7-10 February 1994.Optical Society of America. (1994).OSA Proceedings.**20**.

Kikuchi, H., A. A. Godil and T. Fukui."Electro-optical modulator" Sony Corp., Japan. (CA **125:99649** patent).

Kikuchi, H., G. Ashifu and M. Oka."Continuous UV laser apparatus" Sony Corp, Japan. (CA **125:99573**).

Komine, H., J. M. Fukumoto, J. W.H. Long and E. A. Stappaerts."Tunable mid-infrared wavelength converters for neodymium-doped lasers" 87-91. **LEOS '94. Conference Proceedings. IEEE Lasers and Electro-Optics Society 1994 7th Annual Meeting.** Boston, MA, USA, 31 Oct.-3 Nov. 1994.IEEE. (1994).Proceedings of LEOS'94 ,2 vol. (xx+345+450).

Komine, H., J. M. Fukumoto, J. W.H. Long and E. A. Stappaerts."High-repetition rate infrared OPOs" 269-270. **CLEO'95. Summaries of Papers.** O. S. o. America. Baltimore, MD, 22-26 May 1995.OSA. (1995).1995 Technical Digest Series.**15, 1995 Technical Digest Series.**

Kung, A. H. (1994). "Narrowband mid-infrared generation using KTiOAsO_4 ." *Appl. Phys. Lett.* **65 (9)** 1082-1084

Kung, A. H."Narrowband mid-infrared generation using KTiOAsO_4 " 163-169. **Solid State Lasers and Nonlinear Crystals.** G. J. Quarles, L. Esterwitz and L. K. Cheng. San Jose, CA., 5-7 Feb. 1995.SPIE. (1995).**2379.**

Kung, A. H. (1995). "Efficient conversion of high-power narrow-band Ti:sapphire laser radiation to the mid-infrared in KTiOAsO_4 ." *Optics Lett.* **20 (10)** 1107-1109

Kung, A. H."Efficient generation of tunable narrowband mid-infrared radiation in KTiOAsO_4 " 334-6/WG1-1-3. **Advanced Solid State Lasers - Technical Digest.** O. S. o. America. Memphis, TN , 30 Jan.-2 Feb. 1995.OSA. (1995).**Technical Digest.**

Kung, A. H."Experimental issues of tunable narrowband mid-infrared generation in KTiOAsO_4 " 375-378. **Advanced Solid State Lasers.** B. H. T. Chai and S. A. Payne. Memphis, TN , 30 Jan.-2 Feb. 1995.Optical Society of America. (1995).OSA Proceedings.**24.**

Kung, A. H., S. Fei and H. L. Strauss. (1996). "Mid-infrared sources using dye lasers in KTiOAsO_4 and LiIO_3 ." *Applied Spectroscopy.* **50 (6)** 790-794

Lai, B., N. C. Wong and L. K. Cheng. (1995). "Continuous-wave tunable light source at 1.6 μm by difference-frequency mixing in CsTiOAsO_4 ." *Optics Lett.* **20 (17)** 1779-1781

Lancaster, D. G. and J. M. Dawes. (1995). "A pulsed laser source using stimulated Raman scattering and difference frequency mixing: remote sensing of methane in air." *Optics Comm.* **120** 307-310

Lee, I. and J. Horn."3.5 micron potassium titanyl arsenate optical

parametric oscillator" 59. **1995 OSA Annual Meeting.** O. S. o. America. Portland, Oregon, 10-15 September 1995.OSA. (1995).**Program.**

Loiacono, G. M., D. N. Loiacono, R. A. Stolzenberger and J. Rottenberg."Improved NLO Material to 5 Microns: Growth of CTA, RTA and Mixed Crystals" 27 September 1995.Crystal Associates, Inc., WL-TR-96-4012. (1996).

Marshall, L. R."CW-pumped nonlinear converters" 401. **CLEO'95.**

Summaries of Papers. O. S. o. America. Baltimore, MD, 22-26 May 1995.OSA. (1995).**1995 Technical Digest Series.15, 1995 Technical Digest Series.**

Marshall, L. R."Mid-infrared CW & pulsed optical parametric oscillators" 55. **OSA Annual Meeting.** O. S. o. America. Portland, Oregon, 10-15 September 1995.OSA. (1995).**Program.**

Marshall, L. R."Efficient multiwatt 2-5 μm tunable sources" 368-369 Advance Program p. 128. **CLEO/QELS '96.** O. S. o. America. Anaheim, CA, 2-7 June 1996.OSA. (1996).**1996 Technical Digest Series.9.**

Marshall, L. R., J. Earl and A. Johnson."Efficient 2-5 μm KTP, KTA and ZnGeP₂ OPOs" 171-173. **OSA Trends in Optics and Photonics on Advanced Solid State Lasers.** S. A. Payne and C. R. Pollock. San Francisco, CA, 31 Jan-2 Feb 1996.OSA. (1996).**1.**

Mayo, S. C., P. A. Thomas, S. J. Teat, G. M. Loiacono and D. A. Loiacono. (1994). "Structure and non-linear optical properties of KTiOAsO₄." *Acta Cryst. B50 (6)* 655-662

McGowan, C., D. T. Ried, M. Ebrahimzadeh and W. Sibbett."Mid-infrared femtosecond pulses from a critically phase-matched optical parametric oscillator based on KTiOAsO₄" 342, Advance program p. 124.

CLEO/QELS'96. O. S. o. America. Anaheim, CA. 2-7 June 1996.OSA. (1996).**1996 Technical Digest series.9.**

McGowan, C., D. T. Ried, M. Ebrahimzadeh and W. Sibbett. (1996). "Continuously tunable femtosecond pulses covering 2.1-2.5 μm from an optical parametric oscillator based on RbTiOAsO₄." *J. Modern Optics.*

43(5) 913-918

Miyake, C. I., D. Lowenthal, J. Seamans and M. Bowers."High Repetition Rate Mid-infrared Laser for IRCM" January 1995.Aculite Corp., Bellevue, WA. (1995).

Murray, J. T., N. Peyghambarian and R. C. Powell. (1994). "Near infrared optical parametric oscillators." **Optical Materials.** **4(1)** 55-60

Nelson, M., V. Dominic and T. P. Grayson."Synchronously pumped optical parametric oscillators using KTA: Experimental vs. numerical calculations" Paper CG-8. **The Ohio Section/American Physical Society.** Univ. of Dayton, Dayton, Ohio, 6-7 Oct 1995.(1995).

Nelson, M. D., B. D. Duncan and T. P. Grayson."Oscillation threshold calculations for synchronously pumped optical parametric oscillators" 59. **OSA Annual Meeting.** O. S. o. America. Portland, Oregon, 10-15 September 1995.OSA. (1995).**Program.**

Neuman, W. A. and S. P. Velsko."Optical parametric oscillator performance at high average power" 268-269. **CLEO/QELS '96.** O. S. o. America. Anaheim, CA, 2-7 June 1996.OSA. (1996).1996 Technical Digest Series.**9.**

Pfister, O., M. Murtz, J. Wells and L. Hollberg."Division by three of optical frequencies using noncritically phase-matched RTA" 279 Advance Program p.107. **CLEO/QELS '96.** O. S. o. America. Anaheim, CA, 2-7 June 1996.OSA. (1996).1996 Technical Digest Series.**9.**

Pfister, O., M. Mürtz, J. S. Wells, L. Hollberg and J. T. Murray. (1996). "Division by 3 of optical frequencies by use of difference-frequency generation in noncritically phase-matched RbTiOAsO_4 ." **Optics Lett.** **21(17)** 1387-1389

Phillips, M. L. F., W. T. A. Harrison, T. E. Gier and G. D. Stucky."SHG tuning in the KTP structure field" 225-231. **Growth, Characterization, and Applications of Laser Host and Nonlinear Crystals.** J. T. Lin. Orlando, Florida, 27-28 March 1989.SPIE. (1989).SPIE Proceedings.**1104.**

Phillips, M. L. F., W. T. A. Harrison and G. D. Stucky."Nonlinear optical properties of new KTiOPO_4 isostructures" 84-92. **Inorganic Crystals**

for Optics, Electro-Optics, and Frequency Conversion. P. F. Bordui.
San Diego, CA, 25 July 1991.SPIE, Bellingham, WA. (1991).**1561.**

Phillips, M. L. F., M. T. Anderson and M. B. Sinclair."Optical properties of lanthanide-doped RbTiOAsO_4 and transition metal-doped KTiOPO_4 " 733-40.
Proc. 16th International Conf. Lasers'93. V. J. Corcoran and T. A. Goldman. Lake Tahoe, NV, 6-9 December 1993.STS Press, McLean, VA. (1993).

Powers, P. E., S. Ramakrishna, C. L. Tang and L. K. Cheng. (1993). "Optical parametric oscillation with KTiOAsO_4 ." Optics Letters. **18** 1171-1173

Powers, R. E., R. J. Ellingson, W. S. Pelouch and C. L. Tang. (1993). "Recent advances of the Ti:sapphire-pumped high-repetition-rate femtosecond optical parametric oscillator." J. Opt. Soc. Am. B. **B 10** 2162-2167

Powers, P. E., C. L. Tang and L. K. Cheng. (1994). "High-repetition-rate femtosecond optical parametric oscillator based on CsTiOAsO_4 ." Optics Letters. **19** 37-39

Powers, P. E., C. L. Tang and L. K. Cheng."High-repetition-rate femtosecond OPO using RbTiOAsO_4 " Advance Program, p. 97; 251. **CLEO'94,**

Summaries of papers presented at the Conference on Lasers and Electro-Optics. O. S. o. America. Anaheim, CA 8-13 May 1994.(1994).1994 Technical Digest Series.**8.**

Powers, P. E., C. L. Tang and L. K. Cheng. (1994). "High-repetition-rate femtosecond optical parametric oscillator based on RbTiOAsO_4 ." Optics Lett. **19 (18)** 1439-1441

Powers, P. E."New crystals and new wavelength ranges for ultrafast optical parametric oscillators" Cornell. (1995).

Powers, P. E., L. K. Cheng, W. S. Pelouch and C. L. Tang."Optical parametric oscillation using KTA nonlinear crystals" Cornell Research Foundation, Inc., USA. (CA **122:200716** patent).

Prasad, N. S. and A. R. Geiger."Neodymium-doped potassium titanyl arsenate (Nd:KTA): a new nonlinear optical material" 105. **QELS'95,**

Summaries of Papers. O. S. o. America. Baltimore, MD, 22-26 May 1995.OSA. (1995).**16, 1995 Technical Digest Series.**

Rahlff, C., Y. Tang, W. Sibbett and M. H. Dunn."High-repetition-rate, mid-infrared KTA-OPO at 3.44 μm " 267-268 Advance Program p106. **CLEO/QELS '96.** O. S. o. America. Anaheim, CA, 2-7 June 1996.OSA. (1996).**1996 Technical Digest Series.9.**

Ramabadran, U. B., D. L. Fenimore, D. E. Zelmon, D. Small, P. vonRichter and K. L. Schepler."Improved phase matching predictions based upon mid-ir dispersion data for rubidium titanyl arsenate (RTA)" 105. **OSA Annual Meeting.** O. S. o. America. Portland, Oregon, 10-15 September 1995.OSA. (1995).**Program.**

Reid, D. T., M. Ebrahimzadeh and W. Sibbett. (1995). "Critically phase-matched Ti:sapphire-pumped femtosecond optical parametric oscillator based on RbTiOAsO_4 ." Optics Lett. **20 (1)** 55-57

Reid, D. T., M. Ebrahimzadeh and W. Sibbett."Non-critically phase-matched Ti:sapphire-pumped optical parametric oscillator based on RbTiOAsO_4 " 168-170

TuC5-1-3. Technical Digest- Advanced Solid State Lasers. O. S. o. America. Memphis, TN , 30 Jan.-2 Feb 1995.OSA. (1995).

Reid, D. T., M. Ebrahimzadeh and W. Sibbett."Intercavity-frequency-doubled femtosecond OPO based on noncritically- phase-matched RbTiOAsO_4 " 156. **CLEO'95, Summaries of Papers.** O. S. o. America. Baltimore, MD, 22-26 May 1995.OSA. (1995).**15, 1995 Technical Digest Series.**

Reid, D. T., M. Ebrahimzadeh and W. Sibbett. (1995). "Efficient femtosecond pulse generation in the visible in a frequency-doubled optical parametric oscillator based on RbTiOAsO_4 ." J. Opt. Soc. Am. B. **12 (6)** 1157-1163

Reid, D. T., M. Ebrahimzadeh and W. Sibbett. (1995). "Noncritically phase-matched Ti:sapphire-pumped femtosecond optical parametric oscillator based on RbTiOAsO_4 ." Optics Letters. **20 (1)** 55-57

Reid, D. T., M. Ebrahimzadeh and W. Sibbett. (1995). "Ti:sapphire-pumped femtosecond optical parametric oscillators based on KTiOPO_4 and

RTiOAsO_4 ." Appl. Phys. B. **60(5)** 437-442

Reid, D. T., M. Ebrahimzadeh and W. Sibbett. (1995). "Design criteria and comparison of femtosecond optical parametric oscillators based on KTiOPO_4 and RbTiOAsO_4 ." J. Opt. Soc. Am. B. **12 (11)** 2168-2179

Reid, D. T., M. Ebrahimzadeh and W. Sibbett."Non-critically phase-matched Ti:Sapphire-pumped femtosecond OPO based on RbTiOAsO_4 " 180-183.

Advanced Solid-State Lasers. B. H. T. Chai and S. A. Payne. Memphis. TN, 30 Jan.-2 Feb. 1995.Optical Society of America, Washington, D. C. (1995).**24**.

Risk, W. P. and G. M. Loiacono."Second harmonic generation in a periodically-poled RbTiOAsO_4 waveguide" CPD17-1-3. **CLEO/QELS'96**. O. S. o. America. Anaheim, CA, 2-7 June 1996.OSA. (1996).1996 Technical Digest Series.**9**.

Risk, W. P. and G. M. Loiacono. (1996). "Periodic poling and waveguide frequency doubling in RbTiOAsO_4 ." Appl. Phys. Lett. **69 (3)** 311-313

Scheidt, M., B. Beier, K.-J. Boller and R. Wallenstein."Frequency-stable operation of cw RTA optical parametric oscillators" 341-342.

CLEO/QELS'96. O. S. o. America. Anaheim, CA, 2-7 June 1996.OSA. (1996).1996 Technical Digest Series.**9**.

Sorokina, N., D. Y. Lee, I. A. Verin, V. I. Simonov, V. I. Voronlova and V. K. Yanovsky."Synthesis, properties and crystal structures of some new solid solutions in the systems KTiOPO_4 - TITiOPO_4 , RbTiOPO_4 - TITiOPO_4 and KTiOPO_4 - KGeOPO_4 " 197-203. **ICONO'95: Nonlinear Optics of Low-Dimensional Structures and New Materials**. V. I. Emel'yanov and V. Y. Panchenko. St. Petersburg, Russia, 27 June-1 July 1995.SPIE. (1995).**2801**.

Spence, D. E. and C. L. Tang. (1995). "Characterization and applications of high repetition rate, broadly tunable, femtosecond parametric oscillators." IEEE J. of Selected Topics in Quantum Electronics. **1 (1)** 31-43

Stamm, U. (1995 March). "OPOs advance in Europe, but challenges remain."

Photonics Spectra. **29** (3) 110-112,114,116

Stolzenberger, R. A., D. N. Loiacono and J. Rottenberg."Electro-optic modulators of KTiOAsO_4 and RbTiOAsO_4 " Advanced Program, p. 128; 415. **CLEO'94, Summaries of papers presented by the Conference on Lasers and Electro-Optics.** O. S. o. America. Anaheim, CA 8-13 May 1993.OSA. (1994).1994 Technical Digest Series.**8**.

Tang, C. L., P. E. Powers and R. J. Ellington. (1994). "Optical parametric processes and broadly tunable femtosecond sources." Appl. Phys. B. **58** (3) 243-248

Tang, C. L. (1994). "Optical parametric processes and broadly tunable femtosecond sources." International Journal of Nonlinear Optical Physics. **3** (2) 205-244

Tang, C. L., D. E. Spence, K. C. Burr and S. Wie. (1995). "Femtosecond optical parametric generators are broadly tunable." Laser Focus World. **31** (3) 67-70, 72

Tang, C. L. and L. K. Cheng. (1995). **Fundamentals of Optical Parametric Processes and Oscillators.**130pp. V. S. Letokhov, C. V. Shank, Y. R. Shen and H. Walther.Laser Science and Technology.**20**. Harwood Academic Publishers.Amsterdam.

Wang, J., J. Wei, Y. Liu, L. Shi, M. Jiang, X. Hu and S. Jiang."The growth and properties of some KTP family crystals" 10-16. **Electro-Optic and Second Harmonic Generation Materials, Devices, and Applications.** SPIE. (1996).Proc. SPIE-Int. Soc. Opt. Eng.**2897**.

Wei, J., J. Wang, Y. Liu, L. Shi, M. Wang and Z. Shao. (1994). "Growth, second harmonic and sum frequency generation operations of potassium titanyl arsenate crystal." Chinese Physics Letters. **11** (2) 95-98

Zumsteg, F. C., J. D. Bierlein and T. E. Gier. (1976). " $\text{K}_x\text{Rb}_{1-x}\text{TiOPO}_4$: A new nonlinear optical material." J. Appl. Phys. **47** 4980-4985

3. REFERENCES TO SPECIFIC ISOMORPHS

Since we were mainly interested in extending the optical transmission band further into the infrared, the following bibliographies will be on papers about specific arsenates viz. KTA, RTA and CTA. Out of the 194 total, there are 127 papers referring to KTA, 70 referring to RTA, and 49 referring to CTA.

Summaries of properties of various materials are not given here since a number of excellent review papers by Bierlein and Cheng cover much of this material. Perhaps the best paper is *Ferroelectrics* **142** 209-228 (1993).

3.1 KTA BIBLIOGRAPHY

- Abrabri, M., S. Condom, J. Durand and A. Larbot. (1994). "Elaboration des composes KTiOPO_4 et KTiOAsO_4 par voie sol-gel
Preparation of KTiOPO_4 and KTiOAsO_4 by a sol-gel method." *J. Chim. Phys.* **91(9)** 1419-30 *J. Chim. Phys. Phys.-Chim. Biol.*
- Abrabri, M., M. Rafiq, A. Larbot and J. Durand. (1995). "Study of the solid solution $\text{KTiOPO}_3\text{-}\text{KTiOAsO}_4$. Correlation of structure and optical properties." *J. Chim. Phys. Phys.-Chim. Biol.* **92 (1)** 104-119
- Ballman, A. A., J. D. Bierlein, A. Feretti, T. E. Gier and P. A. Morris. "Doped crystalline compositions and their preparation" du Pont de Nemours, E. I., and Co., USA. (CA **115**:219658 patent).
- Ballman, A. A. and L. K. Cheng. "Doped crystalline titanyl arsenates and their preparation" du Pont de Nemours, E. I., and Co., USA. (CA **120**:42589 patent).
- Ballman, A. A. and L. K. Cheng. "Doped crystalline titanyl arsenates and preparation thereof" du Pont de Nemours, E. I., and Co., USA. (CA **121**:145923 patent).
- Belt, R. F. and J. B. Ings. (1993). "Hydrothermal growth of potassium titanyl arsenate (KTA) in large autoclaves." *J. Crystal Growth.* **128** 956-962
- Bierlein, J. D. and T. E. Gier. "Crystals of $(\text{K}, \text{Rb}, \text{NH}_4)\text{TiO}(\text{P}, \text{As})\text{O}_4$ and their use in electrooptic devices" 6 April 1976. E.I. Du Pont & Co., Wilmington, DE. (1976 US Patent 3,949,323).
- Bierlein, J. D., H. Vanherzeele and A. A. Ballman. (1989). "Linear and nonlinear optical properties of flux-grown KTiOAsO_4 ." *Appl. Phys. Lett.* **54** 783-785 Eratta, *Appl. Phys. Lett.* **61** (26) 3193 (1992).
- Bierlein, J. D. "Potassium Titanyl Phosphate (KTP): Properties, Recent Advances and New Applications" 2-12. **Growth, Characterization, and Applications of Laser Host and Nonlinear Crystals.** J. T. Lin. Orlando, Florida, 27-28 March 1989. SPIE. (1989). **1104**.
- Blasse, G., G. J. Dirksen, L. H. Brixner, A. Feretti and A. P. Thomas. (1991).

"Luminescence in the potassium titanium oxide phosphate (KTiOPO₄) structure field: potassium titanium oxide arsenate (KTiOAsO₄) and potassium tin oxide phosphate (KSnOPO₄)."*Materials Chemistry & Physics.* **27(3)** 279-85

Bosenberg, W. R., L. K. Cheng and J. D. Bierlein."Optical parametric frequency conversion properties of KTiOAsO₄ (KTA)" 154-5. **OSA Proc. Adv. Solid-State Lasers.** A. A. Pinto and T. Y. Fan. OSA. (1993).15.

Bosenberg, W. R., L. K. Cheng and J. D. Bierlein. (1994). "Optical parametric frequency conversion properties of KTiOAsO₄." *Appl. Phys. Lett.* **65** (22) 2765-2767

Boulanger, B., G. Marnier, B. Menaert, X. Cabirol, J. P. Feve, C. Bonnin and P. Villeval. (1993). "Collinear L.C. type II phase-matching for SHG in KTiOAsO₄: Demonstration of its impossibility at 1.064 μm and first experiment at 1.32 μm. Comparison with KTiOPO₄." *Mol. Cryst. Liq. Cryst. Sci. Technol. Sec. B: Nonlinear Optics, Principles, Materials, Phenomena and Devices.* **4** 133-142

Cheng, L. K., J. D. Bierlein and A. A. Ballman. (1991). "Crystal growth of KTiOPO₄ isomorphs from tungstate and molybdate fluxes." *J. Crystal Growth.* **110** 697-703

Cheng, L. K. and J. D. Bierlein. (1993). "KTP and Isomorphs - Recent Progress in Device and Material Development." *Ferroelectrics.* **142** 209-228

Cheng, L. K., L.-T. Cheng, J. D. Bierlein, F. C. Zumsteg and A. A. Ballman. (1993). "Properties of doped and undoped crystals of single domain KTiOAsO₄." *Appl. Phys. Lett.* **62** 346-348

Cheng, L.-T., L. K. Cheng and J. D. Bierlein."Linear and nonlinear optical properties of the arsenate isomorphs of KTP" 43-53. **Growth, Characterization, and Applications of Laser Host and Nonlinear Crystals II.** B. H. T. Chai. Los Angeles, CA 17-18 January 1993.SPIE. (1993).SPIE Proceedings.**1863**.

Cheng, K. L. K., L. T. Cheng, J. D. Bierlein, W. Bindloss, J. Calabrese, J.

Galperin and A. A. Ballman."Preparation of single-domain KTiOAsO₄ crystals for device application" 40-42. **Growth, Characterization, and Applications of Laser Host and Nonlinear Crystals II.** B. H. T. Chai. Los Angeles, CA 17-18 January 1993.SPIE. (1993).SPIE Proceedings.**1863**.

Cheng, L. K., L. T. Cheng, J. Galperin, P. A. M. Hotsenpiller and J. D. Bierlein. (1994). "Crystal growth and characterization of KTiOPO₄ isomorphs from the self-fluxes." *J. Crystal Growth.* **137** 107-115

Cheng, L. K., L. T. Cheng, J. Bierlein and R. Harlow."Frequency-agile materials for visible and near IR frequency conversion" 456-458. **1994 IEEE Nonlinear Optics: Materials, Fundamentals, and Applications.** Waikoloa, Hawaii 25-29 July 1994.IEEE. (1994).

Cheng, L. K., L. T. Cheng, J. D. Bierlein and J. Parise. (1994). "Phase-matching property optimization using birefringence tuning in solid solutions of KTiOPO₄ isomorphs." *Appl. Phys. Lett.* **64** (11) 1321-1323

Cheng, L. K., J. D. Bierlein, C. M. Foris and A. A. Ballman. (1996). "Growth of epitaxial thin films in the KTiOPO₄ family of crystals." *J. Crystal Growth.* **112** 309-315

Cheng, L. K."Hydrothermal process for growing optical-quality single crystals and aqueous mineralizer therefor" du Pont de Nemours, E. I., and Co., USA. (CA **120**:121330 patent).

Chu, D. K. T., J. D. Bierlein and R. G. Hunsperger."Piezoelectric, elastic, and ferroelectric properties of KTiOPO₄ and its isomorphs" 732-743. **Proc. of the 1992 IEEE Frequency Control Symposium.** Hershey, PA, 27-29 May 1992.IEEE. (1992).

Chuang, T., J. Kaskinski and H. R. Verdun."A KTA optical parametric oscillator pumped by a Q-switched, injection-seeded Nd:YAG laser" 150-154. **OSA Trends in Optics and Photonics on Advanced Solid State Lasers.** S. A. Payne and C. R. Pollock. San Francisco, CA, 31 Jan-2 Feb 1996.OSA. (1996).1.

Chuhua, L., G. Kaihui, Z. Ning, Z. Chongzhong, X. Qiuxiang and L. Fei. (1993). "Growth of KTiOAsO₄(KTA) and CsTiOAsO₄(CTA) crystals from new molten

salt system." J. Crystal Growth. **128** 963-965

Dmitriev, V. G., G. G. Gurzadyan and D. N. Nikogosyan. (1991). **Handbook of Nonlinear Optical Crystals.**KTA pp. 106-107. A. E. Siegman.Springer Series in Optical Sciences.**64**. Springer-Verlag.Berlin.

Dusausoy, Y., V. Lorrain, F. Ribert, G. Marnier, B. Menaert, H. Rager and J.-M. Gaite. (1993). "Electron paramagnetic resonance study of Fe^{3+} Centers in KTiOAsO_4 ." Applied Magnetic Resonance. **5(3-4)** 331-337

Ebbers, C. A. (1995). "Thermally insensitive, single-crystal, biaxial electro-optic modulators." J. Optical Soc. Am. B. **12 (6)** 1012-1020

Ebbers, C. A. and S. P. Velsko."Optical and thermo-optical characterization of KTP and its isomorphs for 1.06 μm pumped OPO's" 227-239. **Nonlinear Frequency Generation and Conversion.** M. C. Gupta, W. J. Kozlovsky and D. C. MacPherson. San Jose, CA, 29-31 Jan. 1996.SPIE. (1996).**2700**.

El-Brahimi, M. and J. Durand. (1986). "Structure et properties d'optique non lineaire de KTiOAsO_4 ." Revue de Chimie Minerale. **23** 146-153

El-Haidouri, A., J. Durand and L. Cot. (1990). "Correlation entre structure et generation de second harmonique dans les composes $\text{M}'\text{TiOAsO}_4$ - Correlation between structure and second harmonic generation in $\text{M}'\text{TiOAsO}_4$." Mat. Res. Bull. **25** 1193-1202

Endo, S., V. I. Chani, K. Shimamura and T. Fukuda. (1996). "Growth of new KTP-structured crystals substituted by aliovalent cation pairs." Nippon Kessho Seicho Gakkaishi. **23(3)** 208 In Japanese.

Fei, S., H. L. Strauss and A. H. Kung. (1995). "Mid-infrared generation using KTiOAsO_4 ." Bull. Am. Phys.. Soc. **40 (1)** 366

Fenimore, D. L. and K. L. Schepler."Three-wave nonlinear interactions in KTiOPO_4 (KTP) and KTP isomorphs" September 1993.Wright Laboratory Solid State Electronics Directorate, WL-TR-93-5029. (1993).

Fenimore, D. L., K. L. Schepler and U. B. Ramabadran."Improved Sellmeier

coefficients for potassium titanyl arsenate, KTiOAsO_4 (KTA)" 96. **OSA Annual Meeting, 2-7 October 1994.** O. S. o. America. Dallas, TX.Paper TuW4. (1994).**1994 OSA Annual Meeting Program.**

Fenimore, D. L., K. L. Schepler, U. B. Ramabadran and S. R. McPherson. (1995). "Infrared corrected Sellmeier coefficients for potassium titanyl arsenate." *J. Opt. Soc. Am. B.* **12** (5) 794-796

French, S., M. Ebrahimzadeh and A. Miller."Picosecond optical parametric oscillation in KTiOAsO_4 " CPD47-1-2. **CLEO'95. Summaries of Papers.** O. S. o. America. Baltimore, MD, 22-26 May 1995. OSA. (1995).**15, 1995 Technical Digest Series.**

French, S., M. Ebrahimzadeh and A. Miller. (1996). "High-power, high-repetition-rate picosecond optical parametric oscillator for the near- to mid-infrared." *Optics Lett.* **21** (2) 131-133

French, S., M. Ebrahimzadeh and A. Miller. (1996). "High-power, high-repetition-rate picosecond optical parametric oscillator for the near- to mid-infrared." *J. Modern Optics.* **43** (5) 929-952

Fukumoto, J. M., H. Komine and E. A. Stappaerts."High repetition rate, angle tuned KTiOAsO_4 optical parametric oscillator. Paper WL4" 118. **OSA Annual Meeting, 2-7 October 1994.** O. S. o. America. Dallas, TX.(1994).**Program.**

Furukawa, Y. and F. Nitanda."Ferroelectric single crystals and their heat-treatment" Hitachi Metals Ltd, Japan. (CA **120**:334536 patent).

Furukawa, Y. and F. Nitanda."Poling of ferroelectric single crystals" Hitachi Metals Ltd, Japan. (CA **121**:167543 patent).

Gallagher, P. K. (1993). " Applications of thermal analysis to the study of inorganic materials." *Thermochim. Acta.* **214**(1) 1-7.

Haidouri, A. E., J. Durand and L. Cot. (1990). "Correlation entre structure et generation de second harmonique dans les composes $M\text{TiOAsO}_4$." *Mat. Res. Bull.* **25** 1193-1202

Hamilton, C. E."Solid-state lasers and nonlinear optical devices for the eye safe region" 173-4. **CLEO '94. Summaries of Papers Presented at the Conference on Lasers and Electro-Optics.** Anaheim, CA, 8-13 May 1994.(1994).1994 Technical Digest Series. Conference Edition.**8. 1994 Technical Digest Series. Conference Edition.**

Hamoumi, M., M. Wiegel, G. Blasse, J. F. Favard and Y. Piffard. (1992). "Luminescence of ions with d¹⁰ configuration in compositions with the KTiOPO₄ structure." *Mat. Res. Bull.* **27** 699-703

Harrison, W. T. A., M. L. F. Phillips and G. D. Stucky. (1995). "Crystal structures of potassium rubidium titanyl phosphate K_{1.14}Rb_{0.86}(TiO)₂(PO₄)₂ and potassium titanyl phosphate arsenate, K₂(TiO)₂(P_{0.57}As_{0.43}O₄)₂." *Zeitschrift fur Kristallographie.* **210** (4) 295-297

Haussühl, S., L. Shi, B. Wang, J. Wang, J. Liebertz, A. Wostrack and C. Fink. (1994). "Physical properties of single crystals of KTiPO₄, K_xRb_{1-x}TiOPO₄, (x = 0.85; 0.75), KGeOPO₄ and KTiOAsO₄." *Crystal Research and Technology.* **29** (4) 583-589

Holtom, G. R., R. A. Crowell and X. S. Xie."Non-critically phase-matched femtosecond optical parametric oscillator near 3 microns" 407-409. **Advanced Solid-State Lasers.** T. Y. Fan and B. H. T. Chai. Salt Lake City, 7-10 February 1994.Optical Society of America. (1994).OSA Proceedings.**20.**

Iradi, T. E."Large-scale hydrothermal growth of KTP and KTA" Advanced Program, p. 128
CLEO '94. Summaries of Papers Presented at the Conference on Lasers and Electro-Optics. Vol.8. 1994 Technical Digest Series. Conference Edition pp. 415-16. **CLEO/IQES'94.** Anaheim, CA , 8-13 May 1994.(1994).

Isaenko, L. I., N. A. Pylneva, R. I. Mashkovzhev and V. I. Turikov."Influence of real structure on characteristics of KTA elements" 63-68. **New Materials for Advanced Solid State Lasers.** B. H. T. Chai, S. A. Payne, T. Y. Fan, A. Cassanho and T. H. Allik. Boston, MA 29 Nov-1 Dec 1993.Materials Research Society. (1994).Symposia Proceedings.**329.**

Isyanova, Y., G. A. Rines, D. Welford and P. F. Moulton."Tandem OPO source

generating 1.5-10 μm wavelengths" 174-176. **OSA Trends in Optics and Photonics on Advanced Solid State Lasers.** S. A. Payne and C. R. Pollock. San Francisco, CA, 31 Jan-2 Feb 1996. OSA. (1996).1.

Jacco, J., J. Rottenberg, R. A. Stolzenberger and M. G Loiacono."CsZrOAsO₄(CZA) and K_{1-x}Rb_xTiOAsO₄(KRTA), New nonlinear materials for laser application in the 2-5 μm region" January 1996. Crystal Associates, Inc., WL-TR-96-4024. (1996).

Jani, M. G., J. T. Murray, R. R. Petrin, R. C. Powell, D. N. Loiacono and G. M. Loiacono. (1992). "Pump wavelength tuning of optical parametric oscillations and frequency mixing in KTiOAsO₄." *Appl. Phys. Lett.* **60** 2327-2329

Ji, W., H. P. Li, F. Zhou and N. Zhai."Picosecond z-scan investigation of two-photon absorption and bound electronic self-focusing in second-harmonic-generation crystals" 414-423. **Electro-Optic and Second Harmonic Generation Materials, Devices, and Applications.** SPIE. (1996). Proc. SPIE-Int. Soc. Opt. Eng. **2897**.

Jones, R. P."Parametric oscillation in KTP and KTA at 1064 nm" 357-364. **Solid State Lasers and Nonlinear Crystals.** G. J. Quarles, L. Esterowitz and L. K. Cheng. San Jose, CA, 5-7 Feb 1995. SPIE. (1995). SPIE Proceedings. **2379**.

Kato, K. (1994). "Second-harmonic and sum-frequency generation in KTiOAsO₄." *IEEE J. Quantum Electronics.* **30** 881-883

Kaz, A., R. Burnham, L. R. Marshall and A. Pinto."Non-critically phase-matched, degenerate 4 μm optical parametric oscillator" 443-446. **Advanced Solid-State Lasers.** T. Y. Fan and B. H. T. Fan. Salt Lake City, 7-10 February 1994. Optical Society of America. (1994). OSA Proceedings. **20**.

Kaz, A., L. R. Marshall, A. Pinto and R. Utano."Scaling optical parametric oscillators in power, energy, and beam quality" 466-470. **Advanced Solid-State Lasers.** T. Y. Fan and B. H. T. Chai. Salt Lake City, UT 7-10 February 1994. Optical Society of America. (1994). OSA Proceedings. **20**.

Khodjaoui, A., J. Mangin and G. Marnier. (1994). "Dielectric properties of KTA and secondary optical absorption of KTA and KTP." *Nonlinear Optics*. 7 53-64 *Mol. Cryst. Liq. Cryst. Sci Technol.* B.

Kikuchi, H., A. A. Godil and T. Fukui."Electro-optical modulator" Sony Corp., Japan. (CA 125:99649 patent).

Kikuchi, H., G. Ashifu and M. Oka."Continuous UV laser apparatus" Sony Corp, Japan. (CA 125:99573).

Komine, H., J. M. Fukumoto, J. W.H. Long and E. A. Stappaerts."Tunable mid-infrared wavelength converters for neodymium-doped lasers" 87-91. **LEOS '94. Conference Proceedings. IEEE Lasers and Electro-Optics Society 1994 7th Annual Meeting.** Boston, MA, USA, 31 Oct.-3 Nov. 1994.IEEE. (1994).**Proceedings of LEOS'94 ,2 vol. (xx+345+450).**

Komine, H., J. M. Fukumoto, J. W.H. Long and E. A. Stappaerts."High-repetition rate infrared OPOs" 269-270. **CLEO'95. Summaries of Papers.** O. S. o. America. Baltimore, MD, 22-26 May 1995.OSA. (1995).**1995 Technical Digest Series.15, 1995 Technical Digest Series.**

Kung, A. H. (1994). "Narrowband mid-infrared generation using KTiOAsO_4 ." *Appl. Phys. Lett.* 65 (9) 1082-1084

Kung, A. H."Narrowband mid-infrared generation using KTiOAsO_4 " 163-169. **Solid State Lasers and Nonlinear Crystals.** G. J. Quarles, L. Esterwitz and L. K. Cheng. San Jose, CA., 5-7 Feb. 1995.SPIE. (1995).**2379.**

Kung, A. H. (1995). "Efficient conversion of high-power narrow-band Ti:sapphire laser radiation to the mid-infrared in KTiOAsO_4 ." *Optics Lett.* 20 (10) 1107-1109

Kung, A. H."Efficient generation of tunable narrowband mid-infrared radiation in KTiOAsO_4 " 334-6/WG1-1-3. **Advanced Solid State Lasers - Technical Digest.** O. S. o. America. Memphis, TN , 30 Jan.-2 Feb. 1995.OSA. (1995).**Technical Digest.**

Kung, A. H."Experimental issues of tunable narrowband mid-infrared

generation in KTiOAsO_4 " 375-378. **Advanced Solid State Lasers.** B. H. T. Chai and S. A. Payne. Memphis, TN , 30 Jan.-2 Feb. 1995.Optical Society of America. (1995).OSA Proceedings.**24**.

Kung, A. H., S. Fei and H. L. Strauss. (1996). "Mid-infrared sources using dye lasers in KTiOAsO_4 and LiIO_3 ." **Applied Spectroscopy.** **50 (6)** 790-794

Lancaster, D. G. and J. M. Dawes. (1995). "A pulsed laser source using stimulated Raman scattering and difference frequency mixing: remote sensing of methane in air." **Optics Comm.** **120** 307-310

Lee, I. and J. Horn."3.5 micron potassium titanyl arsenate optical parametric oscillator" 59. **1995 OSA Annual Meeting.** O. S. o. America. Portland, Oregon, 10-15 September 1995.OSA. (1995).**Program.**

Liu, W. J., S. S. Jiang, X. R. Huang, X. R. Hu, C. Z. Ge, J. Y. Wang, J. H. Jiang and Z. G. Wang. (1996). "White-beam synchrotron topographic characterization of flux-grown KTiOAsO_4 ." **Appl. Phys. Lett.** **68 (1)** 25-27

Loiacono, G. M., D. N. Loiacono, J. J. Zola, R. A. Stolzenberger, T. McGee and R. G. Norwood. (1992). "Optical properties and ionic conductivity of KTiOAsO_4 crystals." **Appl. Phys. Lett.** **61** 895-897

Loiacono, G. M., D. N. Loiacono, T. McGee and M. Babb. (1992). "Laser damage formation in KTiOPO_4 and KTiOAsO_4 crystals: Grey tracks." **J. Appl. Phys.** **72** 2705-2712

Loiacono, G. M., D. N. Loiacono, R. A. Stolzenberger and J. Rottenberg."Improved NLO Material to 5 Microns: Growth of CTA, RTA and Mixed Crystals" 27 September 1995.Crystal Associates, Inc., WL-TR-96-4012. (1996).

Mangin, J., G. Marnier, B. Boulanger and B. Menaert."New non-linear optical materials of the KTiOPO_4 family" 65-68. **International Conference on Materials for Non-linear and Electro-optics.** Cambridge.Institute of Physics, Bristol. (1989).Institute of Physics Conference Series.**103:Part 1.**

Marnier, G., B. Boulanger, M. Metzger and B. M. P. Menaert."Melt-solution

synthesis of crystals and epitaxial layers of solid solutions of potassium titanyl phosphate isotypes" German patent.Ger. Offen. DE 3,801,862 (Cl. C30B9/00). 04 Aug 1988. (1988).

Marnier, G., B. Boulanger and B. Menaert. (1989). "Ferroelectric transition and melting temperatures of new compounds: CsTiOAsO_4 and $\text{Cs}_x\text{M}_{1-x}\text{TiOAs}_y\text{P}_{1-y}\text{O}_4$ with M = K or Rb." *J. Phys.:Condensed Matter.* **1** 5509-5513

Marshall, L. R."CW-pumped nonlinear converters" 401. **CLEO'95. Summaries of Papers.** O. S. o. America. Baltimore, MD, 22-26 May 1995.OSA. (1995).**1995 Technical Digest Series.15, 1995 Technical Digest Series.**

Marshall, L. R."Mid-infrared CW & pulsed optical parametric oscillators" 55. **OSA Annual Meeting.** O. S. o. America. Portland, Oregon, 10-15 September 1995.OSA. (1995).**Program.**

Marshall, L. R."Efficient multiwatt 2-5 μm tunable sources" 368-369 Advance Program p. 128. **CLEO/QELS '96.** O. S. o. America. Anaheim, CA, 2-7 June 1996.OSA. (1996).**1996 Technical Digest Series.9.**

Marshall, L. R., J. Earl and A. Johnson."Efficient 2-5 μm KTP, KTA and ZnGeP_2 OPOs" 171-173. **OSA Trends in Optics and Photonics on Advanced Solid State Lasers.** S. A. Payne and C. R. Pollock. San Francisco, CA, 31 Jan-2 Feb 1996.OSA. (1996).**1.**

Mashkovtsev, R. I. and L. I. Isaenko. (1995). "Radiation-induced holelike centers in KTiOAsO_4 ." *Solid State Comm.* **95 (10)** 739-743

Mashkovtsev, R. I. and L. I. Isaenko. (1996). "Spectroscopic study of KTiOAsO_4 single crystals." *Physica Status Solidi b.* **198** 577-585

Mayo, S. C., P. A. Thomas, S. J. Teat, G. M. Loiacono and D. A. Loiacono. (1994). "Structure and non-linear optical properties of KTiOAsO_4 ." *Acta Cryst. B50 (6)* 655-662

McGowan, C., D. T. Ried, M. Ebrahimzadeh and W. Sibbett."Mid-infrared femtosecond pulses from a critically phase-matched optical parametric

oscillator based on KTiOAsO_4 " 342, Advance program p. 124.

CLEO/QELS'96. O. S. o. America. Anaheim, CA. 2-7 June 1996.OSA.
(1996).1996 Technical Digest series.9.

Miyake, C. I., D. Lowenthal, J. Seamans and M. Bowers."High Repetition Rate Mid-infrared Laser for IRCM" January 1995.Aculite Corp., Bellevue, WA.
(1995).

Mohamadou, B., G. E. Kugel and G. Marnier. (1992). "Raman spectra in non-linear $A_{1-x}B_x\text{TiOAsO}_4$ mixed single crystal (A,B=K,Rb,Cs)." Ferroelectrics. **125** 379-383

Morris, P. A., A. Ferretti, J. D. Bierlein and G. M. Loiacono. (1991). "Reduction of the ionic conductivity of flux grown KTiOPO_4 crystals." Journal of Crystal Growth. **109** 367-75

Morris, P. A. "Defect chemistry of nonlinear optical oxide crystals". 380-393. Materials for Nonlinear Optics : Chemical Perspectives.**455**. S. R. Marder, J. E. Sohn and G. D. Stucky. American Chemical Society.Washington D.C. (1991). ACS Symposium Series.Report Morris, P. A."Defect chemistry of nonlinear optical oxide crystals".1991.Report number.

Murray, J. T., N. Peyghambarian and R. C. Powell. (1994). "Near infrared optical parametric oscillators." Optical Materials. **4(1)** 55-60

Nelson, D. F."Low Frequency Properties of Dielectric Crystals" 543. **Landolt-Börstein, New Series, Group III: Solid State Physics.** O. Madelung. Berlin.Springer-Verlag. (1993).III/29b.

Nelson, M., V. Dominic and T. P. Grayson."Synchronously pumped optical parametric oscillators using KTA: Experimental vs. numerical calculations" Paper CG-8. **The Ohio Section/American Physical Society.** Univ. of Dayton, Dayton, Ohio, 6-7 Oct 1995.(1995).

Nelson, M. D., B. D. Duncan and T. P. Grayson."Oscillation threshold calculations for synchronously pumped optical parametric oscillators" 59. **OSA Annual Meeting.** O. S. o. America. Portland, Oregon, 10-15 September 1995.OSA. (1995).Program.

Neuman, W. A. and S. P. Velsko."Optical parametric oscillator performance at high average power" 268-269. **CLEO/QELS '96**. O. S. o. America. Anaheim, CA, 2-7 June 1996. OSA. (1996). 1996 Technical Digest Series. **9**.

Northrup, P. A., J. B. Parise, L. K. Cheng and E. M. McCarron. (1994). "High-temperature single-crystal x-ray diffraction studies of potassium and (Cesium, potassium) titanyl arsenates." **Chemistry of Materials**. **6** 434-440

Pagnoux, C., D. Guyomard, A. Verbaere, Y. Piffard and M. Tournoux. (1991). "Nouveaux composes de l'antimoine isotypes de KTiOPO_4 " New antimony isomorphous derivatives of KTiOPO_4 ." **Comptes Rendus de l'Academie des Sciences, Serie II**. **312 (6)** 611-615

Phillips, M. L. F., W. T. A. Harrison and G. D. Stucky."Nonlinear optical properties of new KTiOPO_4 isostructures" 84-92. **Inorganic Crystals for Optics, Electro-Optics, and Frequency Conversion**. P. F. Bordui. San Diego, CA, 25 July 1991. SPIE, Bellingham, WA. (1991). **1561**.

Phillips, M. L. and G. D. Stucky. (1995). "Hydrothermal synthesis and crystal growth of potassium titanyl arsenate, KTiOAsO_4 ." **Inorganic Syntheses**. **30 (Nonmolecular Solids)** 143-146

Powers, P. E., S. Ramakrishna, C. L. Tang and L. K. Cheng. (1993). "Optical parametric oscillation with KTiOAsO_4 ." **Optics Letters**. **18** 1171-1173

Powers, R. E., R. J. Ellingson, W. S. Pelouch and C. L. Tang. (1993). "Recent advances of the Ti:sapphire-pumped high-repetition-rate femtosecond optical parametric oscillator." **J. Opt. Soc. Am. B** **10** 2162-2167

Powers, P. E."New crystals and new wavelength ranges for ultrafast optical parametric oscillators" Cornell. (1995).

Powers, P. E., L. K. Cheng, W. S. Pelouch and C. L. Tang."Optical parametric oscillation using KTA nonlinear crystals" Cornell Research Foundation, Inc., USA. (CA 122:200716 patent).

Prasad, N. S. and A. R. Geiger."Neodymium-doped potassium titanyl

arsenate (Nd:KTA): a new nonlinear optical material" 105. **QELS'95, Summaries of Papers.** O. S. o. America. Baltimore, MD, 22-26 May 1995. OSA. (1995). **16, 1995 Technical Digest Series.**

Rahlff, C., Y. Tang, W. Sibbett and M. H. Dunn."High-repetition-rate, mid-infrared KTA-OPO at 3.44 μm " 267-268
Advance Program p106. **CLEO/QELS '96.** O. S. o. America. Anaheim, CA, 2-7 June 1996. OSA. (1996). **1996 Technical Digest Series.9.**

Rangan, K. K., B. R. Prasad, C. K. Subramanian and J. Goplakrishnan. (1993). "Coupled substitution of niobium and silicon in KTiOPO_4 and KTiOAsO_4 . Synthesis and nonlinear optical properties of $\text{KTi}_{1-x}\text{Nb}_x\text{OX}_{1-x}\text{Si}_x\text{O}_4$ ($X = \text{P}, \text{As}$)."
Inorganic Chemistry. **32** 4291-4293

Reid, D. T., M. Ebrahimzadeh and W. Sibbett. (1995). "Design criteria and comparison of femtosecond optical parametric oscillators based on KTiOPO_4 and RbTiOAsO_4 ."
J. Opt. Soc. Am. B. **12 (11)** 2168-2179

Risk, W. P. and G. M. Loiacono."Fabrication of waveguides in potassium titanyl arsenate by ion exchange" 461-462
Advance Program p. 143. **CLEO/QELS '96.** O. S. o. America. Anaheim, CA, 2-7 June 1996. OSA. (1996). **1996 Technical Digest series.9.**

Scripsick, M. P., G. M. Loiacono and D. L. Loiacono."Improved growth of KTP and KTA crystals" WL-TR-95-4029, March 1995. Crystal Associates, Inc., Waldwick, NJ. (1995).

Spence, D. E. and C. L. Tang. (1995). "Characterization and applications of high repetition rate, broadly tunable, femtosecond parametric oscillators." **IEEE J. of Selected Topics in Quantum Electronics.** **1 (1)** 31-43

Stolzenberger, R. A., D. N. Loiacono and J. Rottenberg."Electro-optic modulators of KTiOAsO_4 and RbTiOAsO_4 " Advanced Program, p. 128; 415.
CLEO'94, Summaries of papers presented ay the Conference on Lasers and Electro-Optics. O. S. o. America. Anaheim, CA 8-13 May 1993. OSA. (1994). **1994 Technical Digest Series.8.**

Stucky, G. D., M. L. F. Phillips and T. E. Gier. (1989). "The potassium titanyl

phosphate structure field: A model for new nonlinear optical materials." Chemistry of Materials. **1** 492-509

Tang, C. L."Growth, characterization and applications of beta-barium borate and related crystals" Gov. Rep. Announce. Index (U. S.) 1994, 94(20), Abstr. No. 455,238.Cornell Univ., Ithaca, NY. (1993).

Tang, C. L., P. E. Powers and R. J. Ellington. (1994). "Optical parametric processes and broadly tunable femtosecond sources." Appl. Phys. B. **58** (3) 243-248

Tang, C. L. (1994). "Optical parametric processes and broadly tunable femtosecond sources." International Journal of Nonlinear Optical Physics. **3** (2) 205-244

Tang, C. L., D. E. Spence, K. C. Burr and S. Wie. (1995). "Femtosecond optical parametric generators are broadly tunable." Laser Focus World. **31** (3) 67-70, 72

Tang, C. L. and L. K. Cheng. (1995). **Fundamentals of Optical Parametric Processes and Oscillators.** 130pp. V. S. Letokhov, C. V. Shank, Y. R. Shen and H. Walther. **Laser Science and Technology.** 20. Harwood Academic Publishers. Amsterdam.

Tu, C.-S., A. R. Guo, R. Tao, R. S. Katiyar, R. Guo and A. S. Bhalla. (1996). "Temperature dependent Raman scattering in KTiOPO_4 and KTiOAsO_4 single crystals." J. Appl. Phys. **79** (6) 3235-3240

Wang, J., J. Wei, Y. Liu, L. Shi, M. Jiang, X. Hu and S. Jiang."The growth and properties of some KTP family crystals" 10-16. **Electro-Optic and Second Harmonic Generation Materials, Devices, and Applications.** SPIE. (1996). Proc. SPIE-Int. Soc. Opt. Eng.**2897**.

Watabe, K., K. Hanyu, T. Okamoto and T. Watanabe."Top seeded solution growth of crystal for nonlinear optical material" Sony Corp, Japan. (CA **120**:231415 patent).

Watson, G. H. (1991). "Polarized Raman spectra of KTiOAsO_4 and isomeric nonlinear-optical crystals." J. Raman Spectroscopy. **22** 705-713

Wei, J., J. Wang, Y. Liu, L. Shi, M. Wang and Z. Shao. (1994). "Growth, second harmonic and sum frequency generation operations of potassium titanyl arsenate crystal." Chinese Physics Letters. **11 (2)** 95-98

Womersley, M. N. and P. A. Thomas. (1996). "A new Kosters prism interferometer for simultaneous determination of refractive index and thermal expansion of crystals as a function of temperature." J. Appl. Crystallogr. **29(5)** 574-583

Zhong, Z., P. K. Gallagher, D. L. Loiacono and G. M. Loiacono. (1994). "The thermal expansion and stability of KTiOAsO_4 and related compounds." Thermochimica Acta. **234(1-2)** 255-261

Zhou, X. and X. Xu. (1996). "A simple and convenient system for an optical method for crystal orientation." Cryst. Res. Technol. **31(1)** K9-K10

3.2 RTA BIBLIOGRAPHY

Anderson, M. T., M. L. F. Phillips and G. D. Stucky. (1994). "Inorganic materials for anomalous-dispersion phase-matched second-harmonic generation: rubidium titanyl arsenate isomorphs, $\text{Rb}[\text{Ti}_{1-2x}\text{Ln}_x\text{Nb}_x]\text{OAsO}_4$." *J. Non-Crystalline Solids.* **178** 120-128

Anderson, M. T., M. L. F. Phillips, M. B. Sinclair and G. D. Stucky. (1996). "Synthesis of transition-metal-doped KTiOPO_4 and lanthanide-doped RbTiOAsO_4 isomorphs that absorb visible light." *Chemistry of Materials.* **8** 248-256

Ballman, A. A., J. D. Bierlein, A. Ferretti, T. E. Gier and P. A. Morris. "Doped crystalline compositions and their preparation" du Pont de Nemours, E. I., and Co., USA. (CA **115**:219658 patent).

Ballman, A. A. and L. K. Cheng. "Doped crystalline titanyl arsenates and their preparation" du Pont de Nemours, E. I., and Co., USA. (CA **120**:42589 patent).

Ballman, A. A. and L. K. Cheng. "Doped crystalline titanyl arsenates and preparation thereof" du Pont de Nemours, E. I., and Co., USA. (CA **121**:145923 patent).

Bierlein, J. D. and T. E. Gier. "Crystals of (K, Rb, NH_4) TiO(P, As)O_4 and their use in electrooptic devices" 6 April 1976. E.I. Du Pont & Co., Wilmington, DE. (1976 US Patent 3,949,323).

Bolt, R., M. Heim, J. Almgren and J. Åhman. (1996). "A high temperature study of CsTiOAsO_4 and RbTiOAsO_4 ." *J. Cryst. Growth.* **166(1-4)** 537-541

Cheng, L. K., J. D. Bierlein and A. A. Ballman. (1991). "Crystal growth of KTiOPO_4 isomorphs from tungstate and molybdate fluxes." *J. Crystal Growth.* **110** 697-703

Cheng, L.-T., L. K. Cheng and J. D. Bierlein. "Linear and nonlinear optical properties of the arsenate isomorphs of KTP" 43-53. **Growth, Characterization, and Applications of Laser Host and Nonlinear Crystals II.** B. H. T. Chai. Los Angeles, CA 17-18 January 1993. SPIE. (1993). SPIE Proceedings. **1863**.

Cheng, L. K., L. T. Cheng, J. Galperin, P. A. M. Hotsenpiller and J. D. Bierlein. (1994). "Crystal growth and characterization of KTiOPO_4 isomorphs from the self-fluxes." *J. Crystal Growth.* **137** 107-115

Cheng, L. K., L. T. Cheng, J. Bierlein and R. Harlow."Frequency-agile materials for visible and near IR frequency conversion" 456-458. **1994 IEEE Nonlinear Optics: Materials, Fundamentals, and Applications.** Waikoloa, Hawaii 25-29 July 1994.IEEE. (1994).

Cheng, L. K., L. T. Cheng, J. D. Bierlein and J. Parise. (1994). "Phase-matching property optimization using birefringence tuning in solid solutions of KTiOPO_4 isomorphs." *Appl. Phys. Lett.* **64** (11) 1321-1323

Cheng, L. K."Hydrothermal process for growing optical-quality single crystals and aqueous mineralizer therefor" du Pont de Nemours, E. I., and Co., USA. (CA **120**:121330 patent).

Chu, D. K. T., J. D. Bierlein and R. G. Hunsperger. (1992). "Piezoelectric and acoustic properties of potassium titanyl phosphate (KTP) and its isomorphs." *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control.* **39** (6) 683-687

Chu, D. K. T., J. D. Bierlein and R. G. Hunsperger."Piezoelectric, elastic, and ferroelectric properties of KTiOPO_4 and its isomorphs" 732-743. **Proc. of the 1992 IEEE Frequency Control Symposium.** Hershey, PA, 27-29 May 1992.IEEE. (1992).

Chu, D. K. T., H. Hsiung, L. K. Cheng and J. D. Bierlein. (1993). "Curie temperatures and dielectric properties of doped and undoped KTiOPO_4 and isomorphs." *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control.* **49** (6) 819-824

Ebbers, C. A. and S. P. Velsko."Optical and thermo-optical characterization of KTP and its isomorphs for 1.06 μm pumped OPO's" 227-239. **Nonlinear Frequency Generation and Conversion.** M. C. Gupta, W. J. Kozlovsky and D. C. MacPherson. San Jose, CA, 29-31 Jan. 1996.SPIE. (1996).**2700.**

El-Brahimi, M. and J. Durand. (1986). "Structure et properties d'optique non

lineaire de KTiOAsO_4 ." Revue de Chimie Minerale. **23** 146-153

El-Haidouri, A., J. Durand and L. Cot. (1990). "Correlation entre structure et generation de second harmonique dans les composes $\text{M}^{\text{I}}\text{TiOAsO}_4$ - Correlation between structure and second harmonic generation in $\text{M}^{\text{I}}\text{TiOAsO}_4$." Mat. Res. Bull. **25** 1193-1202

Fenimore, D. L. and K. L. Schepler."Three-wave nonlinear interactions in KTiOPO_4 (KTP) and KTP isomorphs" September 1993.Wright Laboratory Solid State Electronics Directorate, WL-TR-93-5029. (1993).

Fenimore, D., K. L. Schepler and S. Kueck."Difference frequency generation in rubidium titanyl arsenate (RTA)" Paper CG-10. **The Ohio Section/American Physical Society.** Univ. of Dayton, Dayton, Ohio, 6-7 Oct 1995.(1995).

Fenimore, D. L., K. L. Schepler, D. Zelmon, S. Kück, U. B. Ramabadran, P. VonRichter and D. Small. (1996). "Rubidium titanyl arsenate difference-frequency generation and validation of new Sellmeier coefficients." J. Opt. Soc. Am. B. **13 (9)** 1935-1940

Furukawa, Y. and F. Nitanda."Ferroelectric single crystals and their heat-treatment" Hitachi Metals Ltd, Japan. (CA **120**:334536 patent).

Gallagher, P. K. (1993). " Applications of thermal analysis to the study of inorganic materials." Thermochim. Acta. **214(1)** 1-7

Guo, A. R., C. S. Tu, R. Tao, R. S. Katiyar, R. Guo and A. S. Bhalla. (1996). "Temperature-dependent Raman scattering in RbTiOAsO_4 and CsTiOAsO_4 single crystals." Ferroelectrics. **188(1-4)** 143-150

Haidouri, A. E., J. Durand and L. Cot. (1990). "Correlation entre structure et generation de second harmonique dans les composes $\text{M}^{\text{I}}\text{TiOAsO}_4$." Mat. Res. Bull. **25** 1193-1202

Hamilton, C. E."Solid-state lasers and nonlinear optical devices for the eye safe region" 173-4. **CLEO '94. Summaries of Papers Presented at the Conference on Lasers and Electro-Optics.** Anaheim, CA, 8-13 May

1994.(1994).1994 Technical Digest Series. Conference Edition.**8. 1994 Technical Digest Series. Conference Edition.**

Han, J., Y. Liu, M. Wang and D. Nie. (1993). "Flux growth and properties of RbTiOAsO₄ (RTA) crystals." *J. Crystal Growth.* **128** 864-866

Haussuehl, S., S. Luping, W. Baolin, J. Crosch, W. Hueben-Riechert and L. Ross."Growth and characterization of single crystal potassium titanyl phosphate (KTiOPO₄) and isomorphous compounds for application in integrated optics" 2284-5. **Vortr. Poster - Symp. Materialforsch. 1991, 2nd.** B. Vierkorn-Rudolph, D. Lillack and H.-J. Clar. Forschungszentrum, Jülich, Germany. (1991).3.

Holtom, G. R., R. A. Crowell and L. K. Cheng."Femtosecond OPOs at 3 microns and beyond: design and performance issues related to the crystal properties of KTP and similar materials" 219-225. **Solid State Lasers and Nonlinear Crystals:** G. J. Quarles, L. Esterowitz and L. K. Cheng. San Jose, CA, 5-7 Feb 1995.SPIE. (1995).SPIE Proceedings.**2379.**

Holtom, G. R., R. A. Crowell and L. K. Cheng. (1995). "Femtosecond mid-infrared optical parametric oscillator based on CsTiOAsO₄." *Optics Lett.* **20 (18)** 1880-1882

Hu, Z. W., P. A. Thomas, J. Webjorn and G. M. Loiacono. (1996). "Domain inversion in RbTiOAsO₄ using electric field poling." *J. Phys. D: Appl. Phys.* **29** 1681-1684

Jacco, J., J. Rottenberg, R. A. Stolzenberger and M. G Loiacono."CsZrOAsO₄(CZA) and K_{1-x}Rb_xTiOAsO₄(KRTA), New nonlinear materials for laser application in the 2-5 μm region" January 1996.Crystal Associates, Inc., WL-TR-96-4024. (1996).

Karlsson, H., F. Laurell, P. Hendricksson and G. Arvidsson. (1996). "Frequency doubling in periodically poled RbTiOAsO₄." *Electronics Letters.* **32 (6)** 556-557

Kikuchi, H., A. A. Godil and T. Fukui."Electro-optical modulator" Sony Corp., Japan. (CA 125:99649 patent).

Kikuchi, H., G. Ashifu and M. Oka."Continuous UV laser apparatus" Sony Corp, Japan. (CA **125**:99573).

Loiacono, G. M., D. N. Loiacono, R. A. Stolzenberger and J. Rottenberg."Improved NLO Material to 5 Microns: Growth of CTA, RTA and Mixed Crystals" 27 September 1995.Crystal Associates, Inc., WL-TR-96-4012. (1996).

Mangin, J., G. Marnier, B. Boulanger and B. Menaert."New non-linear optical materials of the KTiOPO_4 family" 65-68. **International Conference on Materials for Non-linear and Electro-optics.** Cambridge.Institute of Physics, Bristol. (1989).Institute of Physics Conference Series.**103:Part 1.**

Marnier, G., B. Boulanger, M. Metzger and B. M. P. Menaert."Melt-solution synthesis of crystals and epitaxial layers of solid solutions of potassium titanyl phosphate isotypes" German patent.Ger. Offen. DE 3,801,862 (Cl. C30B9/00). 04 Aug 1988. (1988).

Marnier, G., B. Boulanger and B. Menaert. (1989). "Ferroelectric transition and melting temperatures of new compounds: CsTiOAsO_4 and $\text{Cs}_x\text{M}_{1-x}\text{TiOAs}_y\text{P}_{1-y}\text{O}_4$ with M = K or Rb." *J. Phys.:Condensed Matter.* **1** 5509-5513

McGowan, C., D. T. Ried, M. Ebrahimzadeh and W. Sibbett. (1996). "Continuously tunable femtosecond pulses covering 2.1-2.5 μm from an optical parametric oscillator based on RbTiOAsO_4 ." *J. Modern Optics.* **43(5)** 913-918

Mohamadou, B., G. E. Kugel and G. Marnier. (1992). "Raman spectra in non-linear $\text{A}_{1-x}\text{B}_x\text{TiOAsO}_4$ mixed single crystal (A,B=K,Rb,Cs)." *Ferroelectrics.* **125** 379-383

Pfister, O., M. Murtz, J. Wells and L. Hollberg."Division by three of optical frequencies using noncritically phase-matched RTA" 279 Advance Program p.107. **CLEO/QELS '96.** O. S. o. America. Anaheim, CA, 2-7 June 1996.OSA. (1996).1996 Technical Digest Series.**9.**

Pfister, O., M. Mürtz, J. S. Wells, L. Hollberg and J. T. Murray. (1996).

"Division by 3 of optical frequencies by use of difference-frequency generation in noncritically phase-matched RbTiOAsO₄." Optics Lett. **21** (17) 1387-1389

Phillips, M. L. F., M. T. Anderson and M. B. Sinclair."Optical properties of lanthanide-doped RbTiOAsO₄ and transition metal-doped KTiOPO₄" 733-40.

Proc. 16th International Conf. Lasers'93. V. J. Corcoran and T. A. Goldman. Lake Tahoe, NV, 6-9 December 1993.STS Press, McLean, VA. (1993).

Powers, P. E., C. L. Tang and L. K. Cheng."High-repetition-rate femtosecond OPO using RbTiOAsO₄" Advance Program, p. 97; 251. **CLEO'94**,

Summaries of papers presented at the Conference on Lasers and Electro-Optics. O. S. o. America. Anaheim, CA 8-13 May 1994.(1994).1994 Technical Digest Series.**8**.

Powers, P. E., C. L. Tang and L. K. Cheng. (1994). "High-repetition-rate femtosecond optical parametric oscillator based on RbTiOAsO₄." Optics Lett. **19** (18) 1439-1441

Powers, P. E."New crystals and new wavelength ranges for ultrafast optical parametric oscillators" Cornell. (1995).

Ramabadran, U. B., D. L. Fenimore, D. E. Zelmon, D. Small, P. vonRichter and K. L. Schepler."Improved phase matching predictions based upon mid-ir dispersion data for rubidium titanyl arsenate (RTA)" 105. **OSA Annual Meeting.** O. S. o. America. Portland, Oregon, 10-15 September 1995.OSA. (1995).**Program.**

Reid, D. T., M. Ebrahimzadeh and W. Sibbett. (1995). "Critically phase-matched Ti:sapphire-pumped femtosecond optical parametric oscillator based on RbTiOAsO₄." Optics Lett. **20** (1) 55-57

Reid, D. T., M. Ebrahimzadeh and W. Sibbett."Non-critically phase-matched Ti:sapphire-pumped optical parametric oscillator based on RbTiOAsO₄" 168-170

TuC5-1-3. Technical Digest- Advanced Solid State Lasers. O. S. o. America. Memphis, TN , 30 Jan.-2 Feb 1995.OSA. (1995).

Reid, D. T., M. Ebrahimzadeh and W. Sibbett."Intercavity-frequency-doubled femtosecond OPO based on noncritically- phase-matched RbTiOAsO₄" 156.

CLEO'95, Summaries of Papers. O. S. o. America. Baltimore, MD, 22-26 May 1995.OSA. (1995).15, 1995 Technical Digest Series.

Reid, D. T., M. Ebrahimzadeh and W. Sibbett. (1995). "Efficient femtosecond pulse generation in the visible in a frequency-doubled optical parametric oscillator based on RbTiOAsO₄." J. Opt. Soc. Am. B. **12 (6)** 1157-1163

Reid, D. T., M. Ebrahimzadeh and W. Sibbett. (1995). "Noncritically phase-matched Ti:sapphire-pumped femtosecond optical parametric oscillator based on RbTiOAsO₄." Optics Letters. **20 (1)** 55-57

Reid, D. T., M. Ebrahimzadeh and W. Sibbett. (1995). "Ti:sapphire-pumped femtosecond optical parametric oscillators based on KTiOPO₄ and RTiOAsO₄." Appl. Phys. B. **60(5)** 437-442

Reid, D. T., M. Ebrahimzadeh and W. Sibbett. (1995). "Design criteria and comparison of femtosecond optical parametric oscillators based on KTiOPO₄ and RbTiOAsO₄." J. Opt. Soc. Am. B. **12 (11)** 2168-2179

Reid, D. T., M. Ebrahimzadeh and W. Sibbett."Non-critically phase-matched Ti:Sapphire-pumped femtosecond OPO based on RbTiOAsO₄" 180-183.

Advanced Solid-State Lasers. B. H. T. Chai and S. A. Payne. Memphis. TN, 30 Jan.-2 Feb. 1995.Optical Society of America, Washington, D. C. (1995).**24**.

Risk, W. P. and G. M. Loiacono."Second harmonic generation in a periodically-poled RbTiOAsO₄ waveguide" CPD17-1-3. **CLEO/QELS'96.** O. S. o. America. Anaheim, CA, 2-7 June 1996.OSA. (1996).1996 Technical Digest Series.**9**.

Risk, W. P. and G. M. Loiacono. (1996). "Periodic poling and waveguide frequency doubling in RbTiOAsO₄." Appl. Phys. Lett. **69 (3)** 311-313

Scheidt, M., B. Beier, K.-J. Boller and R. Wallenstein."Frequency-stable operation of cw RTA optical parametric oscillators" 341-342.

CLEO/QELS'96. O. S. o. America. Anaheim, CA, 2-7 June 1996.OSA.

(1996).1996 Technical Digest Series.**9**.

Spence, D. E. and C. L. Tang. (1995). "Characterization and applications of high repetition rate, broadly tunable, femtosecond parametric oscillators." IEEE J. of Selected Topics in Quantum Electronics. **1** (1) 31-43

Stamm, U. (1995 March). "OPOs advance in Europe, but challenges remain." Photonics Spectra. **29** (3) 110-112,114,116

Stolzenberger, R. A., D. N. Loiacono and J. Rottenberg."Electro-optic modulators of KTiOAsO_4 and RbTiOAsO_4 " Advanced Program, p. 128; 415.

CLEO'94, Summaries of papers presented by the Conference on Lasers and Electro-Optics. O. S. o. America. Anaheim, CA 8-13 May 1993.OSA. (1994).1994 Technical Digest Series.**8**.

Stucky, G. D., M. L. F. Phillips and T. E. Gier. (1989). "The potassium titanyl phosphate structure field: A model for new nonlinear optical materials." Chemistry of Materials. **1** 492-509

Tang, C. L."Growth, characterization and applications of beta-barium borate and related crystals" Gov. Rep. Announce. Index (U. S.) 1994, 94(20), Abstr. No. 455,238.Cornell Univ., Ithaca, NY. (1993).

Tang, C. L., D. E. Spence, K. C. Burr and S. Wie. (1995). "Femtosecond optical parametric generators are broadly tunable." Laser Focus World. **31** (3) 67-70, 72

Tang, C. L. and L. K. Cheng. (1995). **Fundamentals of Optical Parametric Processes and Oscillators.**130pp. V. S. Letokhov, C. V. Shank, Y. R. Shen and H. Walther.Laser Science and Technology.**20**. Harwood Academic Publishers.Amsterdam.

Thomas, P. A., S. C. Mayo and B. E. Watts. (1992). "Crystal structures of RbTiOAsO_4 , $\text{KTiO}(\text{P}_{0.58},\text{As}_{0.42})\text{O}_4$, RbTiOPO_4 and $(\text{Rb}_{0.465},\text{K}_{0.535})\text{TiOPO}_4$, and analysis of pseudosymmetry in crystals of the KTiOPO_4 family." Acta Cryst. **B48** (4) 401-407

Watabe, K., K. Hanyu, T. Okamoto and T. Watanabe."Top seeded solution

growth of crystal for nonlinear optical material" Sony Corp, Japan. (CA 120:231415 patent).

Zhong, Z., P. K. Gallagher, D. L. Loiacono and G. M. Loiacono. (1994). "The thermal expansion and stability of KTiOAsO_4 and related compounds." *Thermochimica Acta.* **234(1-2)** 255-261

3.3 CTA BIBLIOGRAPHY

Ballman, A. A. and L. K. Cheng."Doped crystalline titanyl arsenates and their preparation" du Pont de Nemours, E. I., and Co., USA. (CA **120**:42589 patent).

Ballman, A. A. and L. K. Cheng."Doped crystalline titanyl arsenates and preparation thereof" du Pont de Nemours, E. I., and Co., USA. (CA **121**:145923 patent).

Bolt, R., M. Heim, J. Almgren and J. Åhman. (1996). "A high temperature study of CsTiOAsO_4 and RbTiOAsO_4 ." *J. Cryst. Growth.* **166**(1-4) 537-541

Cheng, L. K., E. M. M. III, J. Calabrese, J. D. Bierlein and A. A. Ballman. (1993). "Development of the nonlinear optical crystal CsTiOAsO_4 ." *J. Crystal Growth.* **132** 280-288

Cheng, L. K., L. T. Cheng, F. C. Zumsteg, J. D. Bierlein and J. Galperin. (1993). "Development of the nonlinear optical crystal CsTiOAsO_4 II. Crystal growth and characterization." *J. Crystal Growth.* **132** 289-296

Cheng, L. T., L. K. Cheng, J. D. Bierlein and F. C. Zumsteg. (1993). "Nonlinear optical and electro-optical properties of single crystal CsTiOAsO_4 ." *Appl. Phys. Lett.* **63** 2618-2620

Cheng, L. K. and J. D. Bierlein. (1993). "KTP and Isomorphs - Recent Progress in Device and Material Development." *Ferroelectrics.* **142** 209-228

Cheng, L.-T., L. K. Cheng and J. D. Bierlein."Linear and nonlinear optical properties of the arsenate isomorphs of KTP" 43-53. **Growth, Characterization, and Applications of Laser Host and Nonlinear Crystals II.** B. H. T. Chai. Los Angeles, CA 17-18 January 1993.SPIE. (1993).SPIE Proceedings.**1863**.

Cheng, L. T., L. K. Cheng, J. D. Bierlein and F. C. Zumsteg. (1994). "Response to "Comment on 'Nonlinear optical and electro-optical properties of single crystal CsTiOAsO_4 ""[*Appl. Phys. Lett.* **64**,2457 (1994)]." *Appl. Phys. Lett.* **64** 2458

Cheng, L. K., L. T. Cheng, J. Bierlein and R. Harlow."Frequency-agile materials for visible and near IR frequency conversion" 456-458. **1994 IEEE Nonlinear Optics: Materials, Fundamentals, and Applications.** Waikoloa, Hawaii 25-29 July 1994.IEEE. (1994).

Cheng, L. K., L. T. Cheng, J. D. Bierlein and J. Parise. (1994). "Phase-matching property optimization using birefringence tuning in solid solutions of KTiOPO_4 isomorphs." *Appl. Phys. Lett.* **64** (11) 1321-1323

Cheng, L. K."Single crystals of cesium titanyl arsenates and their preparation" du Pont de Nemours, E. I., and Co., USA. (CA **120**:285892 patent).

Chu, D. K. T., J. D. Bierlein and R. G. Hunsperger."Piezoelectric, elastic, and ferroelectric properties of KTiOPO_4 and its isomorphs" 732-743. **Proc. of the 1992 IEEE Frequency Control Symposium.** Hershey, PA, 27-29 May 1992.IEEE. (1992).

Chu, D. K. T., H. Hsiung, L. K. Cheng and J. D. Bierlein. (1993). "Curie temperatures and dielectric properties of doped and undoped KTiOPO_4 and isomorphs." *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control.* **49** (6) 819-824

Chuhua, L., G. Kaihui, Z. Ning, Z. Chongzhong, X. Qiuxiang and L. Fei. (1993). "Growth of KTiOAsO_4 (KTA) and CsTiOAsO_4 (CTA) crystals from new molten salt system." *J. Crystal Growth.* **128** 963-965

Dusausoy, Y., V. Lorrain, F. Ribert, G. Marnier, B. Menaert, H. Rager and J.-M. Gaite. (1993). "Electron paramagnetic resonance study of Fe^{3+} Centers in KTiOAsO_4 ." *Applied Magnetic Resonance.* **5(3-4)** 331-337

EI-Haidouri, A., J. Durand and L. Cot. (1990). "Correlation entre structure et generation de second harmonique dans les composes $M^{\text{I}}\text{TiOAsO}_4$ - Correlation between structure and second harmonic generation in $M^{\text{I}}\text{TiOAsO}_4$." *Mat. Res. Bull.* **25** 1193-1202

Fenimore, D. L. and K. L. Schepler."Three-wave nonlinear interactions in KTiOPO_4 (KTP) and KTP isomorphs" September 1993.Wright Laboratory

Solid State Electronics Directorate, WL-TR-93-5029. (1993).

Gallagher, P. K. (1993). " Applications of thermal analysis to the study of inorganic materials." *Thermochim. Acta.* **214(1)** 1-7

Guo, A. R., C. S. Tu, R. Tao, R. S. Katiyar, R. Guo and A. S. Bhalla. (1996). "Raman scattering in CsTiOAsO_4 single crystal." *Ferroelectr., Lett. Sect.* **21(3/4)** 71-77

Guo, A. R., C.-S. Tu, R. Tao, R. S. Katiyar, R. Guo and A. S. Bhalla. "Temperature dependent Raman scattering in CsTiOAsO_4 single crystal" 661-666. **Thermodynamics and Kinetics of Phase Transformations.** MRS. (1996).Mater. Res. Soc. Symp. Proc.**398**.

Guo, A. R., C. S. Tu, R. Tao, R. S. Katiyar, R. Guo and A. S. Bhalla. (1996). "Temperature-dependent Raman scattering in RbTiOAsO_4 and CsTiOAsO_4 single crystals." *Ferroelectrics.* **188(1-4)** 143-150

Haidouri, A. E., J. Durand and L. Cot. (1990). "Correlation entre structure et generation de second harmonique dans les composes $\text{M}^{\text{I}}\text{TiOAsO}_4$." *Mat. Res. Bull.* **25** 1193-1202

Holtom, G. R., R. A. Crowell and L. K. Cheng."Femtosecond OPOs at 3 microns and beyond: design and performance issues related to the crystal properties of KTP and similar materials" 219-225. **Solid State Lasers and Nonlinear Crystals.** G. J. Quarles, L. Esterowitz and L. K. Cheng. San Jose, CA, 5-7 Feb 1995.SPIE. (1995).SPIE Proceedings.**2379**.

Holtom, G. R., R. A. Crowell and L. K. Cheng. (1995). "Femtosecond mid-infrared optical parametric oscillator based on CsTiOAsO_4 ." *Optics Lett.* **20 (18)** 1880-1882

Kikuchi, H., A. A. Godil and T. Fukui."Electro-optical modulator" Sony Corp., Japan. (CA **125:99649** patent).

Kikuchi, H., G. Ashifu and M. Oka."Continuous UV laser apparatus" Sony Corp, Japan. (CA **125:99573**).

Kunz, M., R. Dinnebier, L. K. Cheng, E. M. McCarron, D. E. Cox, J. B. Parise, M.

Gehrke, J. Calabrese, P. W. Stephens, T. Vogt and R. Papoula. (1995). "Cs(TiAs)O₅ and Cs(TiP)O₅: A disordered parent structure of ABOCO₄ compounds." *J. Solid State Chemistry.* **120** 299-310

Lai, B., N. C. Wong and L. K. Cheng. (1995). "Continuous-wave tunable light source at 1.6 μm by difference-frequency mixing in CsTiOAsO₄." *Optics Lett.* **20 (17)** 1779-1781

Loiacono, G. M. and D. N. Loiacono."Synthesis, Crystal Growth and Characterization of CsTiOAsO₄ for OPO Applications to 5 Microns" 6 November 1992.Crystal Associates Inc., WL-TR-92-4103. (1992).

Loiacono, G. M., D. N. Loiacono and R. A. Stolzenberger. (1993). "Crystal growth and characterization of ferroelectric CsTiOAsO₄." *J. Crystal Growth.* **131** 323-330

Loiacono, G. M. (1994). "Comment on "Nonlinear optical and electro-optical properties of single crystal CsTiOAsO₄" [Appl. Phys. Lett. **63**, 2613 (1993)]." *Appl. Phys. Lett.* **64** 2457

Loiacono, G. M., D. N. Loiacono, R. A. Stolzenberger and J. Rottenberg."Improved NLO Material to 5 Microns: Growth of CTA, RTA and Mixed Crystals" 27 September 1995.Crystal Associates, Inc., WL-TR-96-4012. (1996).

Marnier, G., B. Boulanger and B. Menaert. (1989). "Ferroelectric transition and melting temperatures of new compounds: CsTiOAsO₄ and Cs_xM_{1-x}TiOAs_yP_{1-y}O₄ with M = K or Rb." *J. Phys.:Condensed Matter.* **1** 5509-5513

Mayo, S. C., P. A. Thomas, S. J. Teat, G. M. Loiacono and D. A. Loiacono. (1994). "Structure and non-linear optical properties of KTiOAsO₄." *Acta Cryst. B50 (6)* 655-662

Mohamadou, B., G. E. Kugel and G. Marnier. (1992). "Raman spectra in non-linear A_{1-x}B_xTiOAsO₄ mixed single crystal (A,B=K,Rb,Cs)." *Ferroelectrics.* **125** 379-383

Powers, P. E., C. L. Tang and L. K. Cheng. (1994). "High-repetition-rate femtosecond optical parametric oscillator based on CsTiOAsO_4 ." Optics Letters. **19** 37-39

Powers, P. E."New crystals and new wavelength ranges for ultrafast optical parametric oscillators" Cornell. (1995).

Protas, P. J., G. Marnier, B. Boulanger and B. Menaert. (1989). "Structure cristalline de CsTiO(AsO_4)." Acta Cryst. **C45** 1123-1125

Reid, D. T., M. Ebrahimzadeh and W. Sibbett. (1995). "Design criteria and comparison of femtosecond optical parametric oscillators based on KTiOPO_4 and RbTiOAsO_4 ." J. Opt. Soc. Am. B. **12 (11)** 2168-2179

Spence, D. E. and C. L. Tang. (1995). "Characterization and applications of high repetition rate, broadly tunable, femtosecond parametric oscillators." IEEE J. of Selected Topics in Quantum Electronics. **1 (1)** 31-43

Tang, C. L."Growth, characterization and applications of beta-barium borate and related crystals" Gov. Rep. Announce. Index (U. S.) 1994, 94(20), Abstr. No. 455,238.Cornell Univ., Ithaca, NY. (1993).

Tang, C. L., P. E. Powers and R. J. Ellington. (1994). "Optical parametric processes and broadly tunable femtosecond sources." Appl. Phys. B. **58 (3)** 243-248

Tang, C. L., D. E. Spence, K. C. Burr and S. Wie. (1995). "Femtosecond optical parametric generators are broadly tunable." Laser Focus World. **31 (3)** 67-70, 72

Tang, C. L. and L. K. Cheng. (1995). **Fundamentals of Optical Parametric Processes and Oscillators.** 130pp. V. S. Letokhov, C. V. Shank, Y. R. Shen and H. Walther. **Laser Science and Technology.** 20. Harwood Academic Publishers. Amsterdam.

Thomas, P. A., A. M. Glazer and B. E. Watts. (1990). "Crystal structure and nonlinear optical properties of KSnOPO_4 and their comparison with KTiOPO_4 ." Acta Cryst. **B46** 333-343

Thomas, P. A., S. C. Mayo and B. E. Watts. (1992). "Crystal structures of RbTiOAsO₄, KTiO(P_{0.58},As_{0.42})O₄, RbTiOPO₄ and (Rb_{0.465},K_{0.535})TiOPO₄, and analysis of pseudosymmetry in crystals of the KTiOPO₄ family." *Acta Cryst.* **B48 (4)** 401-407

Watabe, K., K. Hanyu, T. Okamoto and T. Watanabe."Top seeded solution growth of crystal for nonlinear optical material" Sony Corp, Japan. (CA 120:231415 patent).

Zhong, Z., P. K. Gallagher, D. L. Loiacono and G. M. Loiacono. (1994). "The thermal expansion and stability of KTiOAsO₄ and related compounds." *Thermochimica Acta.* **234(1-2)** 255-261

4. GENERAL BIBLIOGRAPHY OF KTP ISOMORPHS

The following is the total bibliography of KTP isomorphs including RTP, CTP and Th compounds.

Abrabri, M., S. Condom, J. Durand and A. Larbot. (1994). "Elaboration des composes KTiOPO_4 et KTiOAsO_4 par voie sol-gel
Preparation of KTiOPO_4 and KTiOAsO_4 by a sol-gel method." *J. Chim. Phys.* **91(9)** 1419-30 *J. Chim. Phys. Phys.-Chim. Biol.*

Abrabri, M., M. Rafiq, A. Larbot and J. Durand. (1995). "Study of the solid solution $\text{KTiOPO}_3\text{-}\text{KTiOAsO}_4$. Correlation of structure and optical properties." *J. Chim. Phys. Phys.-Chim. Biol.* **92 (1)** 104-119

Agostinelli, J. A., M. C. Gupta and J. M. Mir."Frequency conversion in inorganic thin film waveguides by quasi-phase-matching" Eastman Kodak Co., USA. (CA **121**:69079 patent).

Anderson, M. T., M. L. F. Phillips and G. D. Stucky. (1994). "Inorganic materials for anomalous-dispersion phase-matched second-harmonic generation: rubidium titanyl arsenate isomorphs, $\text{Rb}[\text{Ti}_{1-2x}\text{Ln}_x\text{Nb}_x]\text{OAsO}_4$." *J. Non-Crystalline Solids.* **178** 120-128

Anderson, M. T., M. L. F. Phillips, M. B. Sinclair and G. D. Stucky. (1996). "Synthesis of transition-metal-doped KTiOPO_4 and lanthanide-doped RbTiOAsO_4 isomorphs that absorb visible light." *Chemistry of Materials.* **8** 248-256

Ballman, A. A., J. D. Bierlein, A. Ferretti, T. E. Gier and P. A. Morris."Doped crystalline compositions and their preparation" du Pont de Nemours, E. I., and Co., USA. (CA **115**:219658 patent).

Ballman, A. A. and L. K. Cheng."Substituted titanyl arsenate phosphate waveguides grown by liquid-phase epitaxy and process of making same" du Pont de Nemours, E. I., and Co., USA. (CA **116**:31027 patent).

Ballman, A. A. and L. K. Cheng."Doped crystalline titanyl arsenates and their preparation" du Pont de Nemours, E. I., and Co., USA. (CA **120**:42589 patent).

Ballman, A. A. and L. K. Cheng."Doped crystalline titanyl arsenates and preparation thereof" du Pont de Nemours, E. I., and Co., USA. (CA **121**:145923 patent).

Belt, R. F. and J. B. Ings. (1993). "Hydrothermal growth of potassium titanyl arsenate (KTA) in large autoclaves." *J. Crystal Growth.* **128** 956-962

Bierlein, J. D. and T. E. Gier."Crystals of (K, Rb, NH₄)TiO(P, As)O₄ and their use in electrooptic devices" 6 April 1976.E.I. Du Pont & Co., Wilmington, DE. (1976 US Patent 3,949,323).

Bierlein, J. D., H. Vanherzeele and A. A. Ballman. (1989). "Linear and nonlinear optical properties of flux-grown KTiOAsO₄." *Appl. Phys. Lett.* **54** 783-785 Eratta, *Appl. Phys. Lett.* **61** (26) 3193 (1992).

Bierlein, J. D."Potassium Titanyl Phosphate (KTP): Properties, Recent Advances and New Applications" 2-12. **Growth, Characterization, and Applications of Laser Host and Nonlinear Crystals.** J. T. Lin. Orlando, Florida, 27-28 March 1989.SPIE. (1989).**1104**.

Bierlein, J. D., L. K. Cheng and L. T. A. Cheng."Increasing the birefringence of potassium titanyl phosphate (KTP) and its isomorphs for type II phase matching" du Pont de Nemours, E. I., and Co., USA. (CA 121:69126 patent).

Blasse, G., G. J. Dirksen, L. H. Brixner, A. Feretti and A. P. Thomas. (1991). "Luminescence in the potassium titanium oxide phosphate (KTiOPO₄) structure field: potassium titanium oxide arsenate (KTiOAsO₄) and potassium tin oxide phosphate (KS_nOPO₄)."*Materials Chemistry & Physics.* **27(3)** 279-85

Bolt, R., M. Heim, J. Almgren and J. Åhman. (1996). "A high temperature study of CsTiOAsO₄ and RbTiOAsO₄." *J. Cryst. Growth.* **166(1-4)** 537-541

Bosenberg, W. R., L. K. Cheng and J. D. Bierlein."Optical parametric frequency conversion properties of KTiOAsO₄ (KTA)" 154-5. **OSA Proc. Adv. Solid-State Lasers.** A. A. Pinto and T. Y. Fan. OSA. (1993).**15**.

Bosenberg, W. R., L. K. Cheng and J. D. Bierlein. (1994). "Optical parametric frequency conversion properties of KTiOAsO₄." *Appl. Phys. Lett.* **65 (22)** 2765-2767

Boulanger, B., G. Marnier, B. Menaert, X. Cabirol, J. P. Feve, C. Bonnin and P. Villevial. (1993). "Collinear L.C. type II phase-matching for SHG in KTiOAsO_4 : Demonstration of its impossibility at 1.064 μm and first experiment at 1.32 μm . Comparison with KTiOPO_4 ." *Mol. Cryst. Liq. Cryst. Sci. Technol. Sec. B: Nonlinear Optics, Principles, Materials, Phenomena and Devices.* **4** 133-142

Chani, V., K. Shimamura, T. Fukuda and S. Endo. "New nonlinear optical crystals of KTP family" Program, p.134. **Solid State Chemistry of Inorganic Materials.** P. Davies, A. Jacobson, C. Torardi and T. Vanderah. MRS, Boston, MA, 2-5 Dec 1996.(1996).

Chen, Q. and W. P. Risk. "Periodically poled KTiOPO_4 : A "new" nonlinear material for bulk interactions" 45-48. **Advanced Solid State Lasers.** B. H. T. Chai and S. A. Payne. Memphis, TN 30 Jan-2 Feb 1995.Optical Society of America. (1995).OSA Proceedings.**24**.

Cheng, L. K., J. D. Bierlein and A. A. Ballman. (1991). "Crystal growth of KTiOPO_4 isomorphs from tungstate and molybdate fluxes." *J. Crystal Growth.* **110** 697-703

Cheng, L. K., E. M. M. III, J. Calabrese, J. D. Bierlein and A. A. Ballman. (1993). "Development of the nonlinear optical crystal CsTiOAsO_4 ." *J. Crystal Growth.* **132** 280-288

Cheng, L. K., L. T. Cheng, F. C. Zumsteg, J. D. Bierlein and J. Galperin. (1993). "Development of the nonlinear optical crystal CsTiOAsO_4 II. Crystal growth and characterization." *J. Crystal Growth.* **132** 289-296

Cheng, L. T., L. K. Cheng, J. D. Bierlein and F. C. Zumsteg. (1993). "Nonlinear optical and electro-optical properties of single crystal CsTiOAsO_4 ." *Appl. Phys. Lett.* **63** 2618-2620

Cheng, L. K. and J. D. Bierlein. (1993). "KTP and Isomorphs - Recent Progress in Device and Material Development." *Ferroelectrics.* **142** 209-228

Cheng, L. K., L.-T. Cheng, J. D. Bierlein, F. C. Zumsteg and A. A. Ballman. (1993). "Properties of doped and undoped crystals of single domain

KTiOAsO_4 ." Appl. Phys. Lett. **62** 346-348

Cheng, L.-T., L. K. Cheng and J. D. Bierlein."Linear and nonlinear optical properties of the arsenate isomorphs of KTP" 43-53. **Growth, Characterization, and Applications of Laser Host and Nonlinear Crystals II.** B. H. T. Chai. Los Angeles, CA 17-18 January 1993.SPIE. (1993).SPIE Proceedings.**1863**.

Cheng, K. L. K., L. T. Cheng, J. D. Bierlein, W. Bindloss, J. Calabrese, J. Galperin and A. A. Ballman."Preparation of single-domain KTiOAsO_4 crystals for device application" 40-42. **Growth, Characterization, and Applications of Laser Host and Nonlinear Crystals II.** B. H. T. Chai. Los Angeles, CA 17-18 January 1993.SPIE. (1993).SPIE Proceedings.**1863**.

Cheng, L. T., L. K. Cheng, J. D. Bierlein and F. C. Zumsteg. (1994). "Response to "Comment on 'Nonlinear optical and electro-optical properties of single crystal CsTiOAsO_4 "[Appl. Phys. Lett. **64**,2457 (1994)]." Appl. Phys. Lett. **64** 2458

Cheng, L. K., L. T. Cheng, J. Galperin, P. A. M. Hotsenpiller and J. D. Bierlein. (1994). "Crystal growth and characterization of KTiOPO_4 isomorphs from the self-fluxes." J. Crystal Growth. **137** 107-115

Cheng, L. K., L. T. Cheng, J. Bierlein and R. Harlow."Frequency-agile materials for visible and near IR frequency conversion" 456-458. **1994 IEEE Nonlinear Optics: Materials, Fundamentals, and Applications.** Waikoloa, Hawaii 25-29 July 1994.IEEE. (1994).

Cheng, L. K., L. T. Cheng, J. Bierlein and R. Harlow. (1994). "Blue light generation using bulk single crystals of niobium-doped KTiOPO_4 ." Appl. Phys. Lett. **64** (2) 155-157

Cheng, L. K., L. T. Cheng, J. D. Bierlein and J. Parise. (1994). "Phase-matching property optimization using birefringence tuning in solid solutions of KTiOPO_4 isomorphs." Appl. Phys. Lett. **64** (11) 1321-1323

Cheng, L. K., J. D. Bierlein, C. M. Foris and A. A. Ballman. (1996). "Growth of epitaxial thin films in the KTiOPO_4 family of crystals." J. Crystal Growth. **112** 309-315

Cheng, L. K."Hydrothermal process for growing optical-quality single crystals and aqueous mineralizer therefor" du Pont de Nemours, E. I., and Co., USA. (CA 120:121330 patent).

Cheng, L. K."Single crystals of cesium titanyl arsenates and their preparation" du Pont de Nemours, E. I., and Co., USA. (CA 120:285892 patent).

Chu, D. K. T., J. D. Bierlein and R. G. Hunsperger. (1992). "Piezoelectric and acoustic properties of potassium titanyl phosphate (KTP) and its isomorphs." IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control. **39** (6) 683-687

Chu, D. K. T., J. D. Bierlein and R. G. Hunsperger."Piezoelectric, elastic, and ferroelectric properties of KTiOPO_4 and its isomorphs" 732-743. **Proc. of the 1992 IEEE Frequency Control Symposium.** Hershey, PA, 27-29 May 1992.IEEE. (1992).

Chu, D. K. T., H. Hsiung, L. K. Cheng and J. D. Bierlein. (1993). "Curie temperatures and dielectric properties of doped and undoped KTiOPO_4 and isomorphs." IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control. **49** (6) 819-824

Chu, D. K.-T., R. C. Ebersole and H. Hsiung."Analyte-responsive potassium titanyl phosphate (KTP) composition and method" du Pont de Nemours, E. I., and Co., USA. (CA 122:101137 patent).

Chuang, T., J. Kaskinski and H. R. Verdun."A KTA optical parametric oscillator pumped by a Q-switched, injection-seeded Nd:YAG laser" 150-154. **OSA Trends in Optics and Photonics on Advanced Solid State Lasers.** S. A. Payne and C. R. Pollock. San Francisco, CA, 31 Jan-2 Feb 1996.OSA. (1996).1.

Chuhua, L., G. Kaihui, Z. Ning, Z. Chongzhong, X. Qiuxiang and L. Fei. (1993). "Growth of KTiOAsO_4 (KTA) and CsTiOAsO_4 (CTA) crystals from new molten salt system." J. Crystal Growth. **128** 963-965

Dmitriev, V. G., G. G. Gurzadyan and D. N. Nikogosyan. (1991). **Handbook of Nonlinear Optical Crystals.**KTA pp. 106-107. A. E. Siegman.Springer

Series in Optical Sciences.64. Springer-Verlag.Berlin.

Dusausoy, Y., V. Lorrain, F. Ribert, G. Marnier, B. Menaert, H. Rager and J.-M. Gaite. (1993). "Electron paramagnetic resonance study of Fe³⁺ Centers in KTiOAsO₄." Applied Magnetic Resonance. 5(3-4) 331-337

Ebbers, C. A. (1995). "Thermally insensitive, single-crystal, biaxial electro-optic modulators." J. Optical Soc. Am. B. 12 (6) 1012-1020

Ebbers, C. A. and S. P. Velsko."Optical and thermo-optical characterization of KTP and its isomorphs for 1.06 μm pumped OPO's" 227-239. **Nonlinear Frequency Generation and Conversion.** M. C. Gupta, W. J. Kozlovsky and D. C. MacPherson. San Jose, CA, 29-31 Jan. 1996.SPIE. (1996).**2700.**

El-Brahimi, M. and J. Durand. (1986). "Structure et properties d'optique non lineaire de KTiOAsO₄." Revue de Chimie Minerale. 23 146-153

El-Haidouri, A., J. Durand and L. Cot. (1990). "Correlation entre structure et generation de second harmonique dans les composes M^ITiOAsO₄ - Correlation between structure and second harmonic generation in M^ITiOAsO₄." Mat. Res. Bull. 25 1193-1202

Endo, S., V. I. Chani, K. Shimamura and T. Fukuda. (1996). "Growth of new KTP-structured crystals substituted by aliovalent cation pairs." Nippon Kessho Seicho Gakkaishi. 23(3) 208 In Japanese.

Fei, S., H. L. Strauss and A. H. Kung. (1995). "Mid-infrared generation using KTiOAsO₄." Bull. Am. Phys.. Soc. 40 (1) 366

Fenimore, D. L. and K. L. Schepler."Three-wave nonlinear interactions in KTiOPO₄ (KTP) and KTP isomorphs" September 1993.Wright Laboratory Solid State Electronics Directorate, WL-TR-93-5029. (1993).

Fenimore, D. L., K. L. Schepler and U. B. Ramabadran."Improved Sellmeier coefficients for potassium titanyl arsenate, KTiOAsO₄ (KTA)" 96. **OSA Annual Meeting, 2-7 October 1994.** O. S. o. America. Dallas, TX.Paper TuW4. (1994).**1994 OSA Annual Meeting Program.**

Fenimore, D. L., K. L. Schepler, U. B. Ramabadran and S. R. McPherson. (1995). "Infrared corrected Sellmeier coefficients for potassium titanyl arsenate." *J. Opt. Soc. Am. B.* **12** (5) 794-796

Fenimore, D., K. L. Schepler and S. Kueck. "Difference frequency generation in rubidium titanyl arsenate (RTA)" Paper CG-10. **The Ohio Section/American Physical Society.** Univ. of Dayton, Dayton, Ohio, 6-7 Oct 1995.(1995).

Fenimore, D. L., K. L. Schepler, D. Zelmon, S. Kück, U. B. Ramabadran, P. VonRichter and D. Small. (1996). "Rubidium titanyl arsenate difference-frequency generation and validation of new Sellmeier coefficients." *J. Opt. Soc. Am. B.* **13** (9) 1935-1940

Feve, J. P., B. Boulanger, X. Cabriol, N. Menaert, G. Marnier, C. Bonnin and P. Villeval. (1995). "Non-critically phase-matched cascaded THG at 440 nm in $\text{KTiOP}_{1-y}\text{As}_y\text{O}_4$ crystals." *Optics Comm.* **115** 323-326

French, S., M. Ebrahimzadeh and A. Miller. "Picosecond optical parametric oscillation in KTiOAsO_4 " CPD47-1-2. **CLEO'95. Summaries of Papers.** O. S. o. America. Baltimore, MD, 22-26 May 1995. OSA. (1995). **15, 1995 Technical Digest Series.**

French, S., M. Ebrahimzadeh and A. Miller. (1996). "High-power, high-repetition-rate picosecond optical parametric oscillator for the near- to mid-infrared." *Optics Lett.* **21** (2) 131-133

French, S., M. Ebrahimzadeh and A. Miller. (1996). "High-power, high-repetition-rate picosecond optical parametric oscillator for the near- to mid-infrared." *J. Modern Optics.* **43** (5) 929-952

Fukumoto, J. M., H. Komine and E. A. Stappaerts. "High repetition rate, angle tuned KTiOAsO_4 optical parametric oscillator. Paper WL4" 118. **OSA Annual Meeting, 2-7 October 1994.** O. S. o. America. Dallas, TX.(1994).**Program.**

Furukawa, Y. and F. Nitanda. "Ferroelectric single crystals and their heat-treatment" Hitachi Metals Ltd, Japan. (CA 120:334536 patent).

Furukawa, Y., M. Sato and K. Ito."Crystal growth and potassium titanyl phosphate crystals and analogous compounds" Hitachi Metals Ltd, Japan. (CA 121:145844 patent).

Furukawa, Y. and F. Nitanda."Poling of ferroelectric single crystals" Hitachi Metals Ltd, Japan. (CA 121:167543 patent).

Gallagher, P. K. (1993). " Applications of thermal analysis to the study of inorganic materials." *Thermochim. Acta.* **214(1)** 1-7

Guo, A. R., C. S. Tu, R. Tao, R. S. Katiyar, R. Guo and A. S. Bhalla. (1996). "Raman scattering in CsTiOAsO_4 single crystal." *Ferroelectr., Lett. Sect.* **21(3/4)** 71-77

Guo, A. R., C.-S. Tu, R. Tao, R. S. Katiyar, R. Guo and A. S. Bhalla."Temperature dependent Raman scattering in CsTiOAsO_4 single crystal" 661-666. **Thermodynamics and Kinetics of Phase Transformations.** MRS. (1996).Mater. Res. Soc. Symp. Proc.**398**.

Guo, A. R., C. S. Tu, R. Tao, R. S. Katiyar, R. Guo and A. S. Bhalla. (1996). "Temperature-dependent Raman scattering in RbTiOAsO_4 and CsTiOAsO_4 single crystals." *Ferroelectrics.* **188(1-4)** 143-150

Haidouri, A. E., J. Durand and L. Cot. (1990). "Correlation entre structure et generation de second harmonique dans les composes $\text{M}^{\text{I}}\text{TiOAsO}_4$." *Mat. Res. Bull.* **25** 1193-1202

Hamilton, C. E."Solid-state lasers and nonlinear optical devices for the eye safe region" 173-4. **CLEO '94. Summaries of Papers Presented at the Conference on Lasers and Electro-Optics.** Anaheim, CA, 8-13 May 1994.(1994).1994 Technical Digest Series. Conference Edition.**8. 1994 Technical Digest Series. Conference Edition.**

Hamoumi, M., M. Wiegel, G. Blasse, J. F. Favard and Y. Piffard. (1992). "Luminescence of ions with d^{10} configuration in compositions with the KTiOPO_4 structure." *Mat. Res. Bull.* **27** 699-703

Han, J., Y. Liu, M. Wang and D. Nie. (1993). "Flux growth and properties of RbTiOAsO_4 (RTA) crystals." *J. Crystal Growth.* **128** 864-866

Harrison, W. T. A., M. L. F. Phillips and G. D. Stucky. (1995). "Crystal structures of potassium rubidium titanyl phosphate $K_{1.14}Rb_{0.86}(TiO)_2(PO_4)_2$ and potassium titanyl phosphate arsenate, $K_2(TiO)_2(P_{0.57}As_{0.43}O_4)_2$." Zeitschrift fur Kristallographie. **210** (4) 295-297

Harrison, W. T. A., T. E. Gier, G. D. Stucky and A. J. Schultz. (1995). "Structural study of the ferroelectric to paraelectric phase transition in $TiTiOPO_4$." Materials Research Bulletin. **30**(11) 1341-1349

Haussuehl, S., S. Luping, W. Baolin, J. Crosch, W. Hueben-Riechert and L. Ross."Growth and characterization of single crystal potassium titanyl phosphate ($KTiOPO_4$) and isomorphous compounds for application in integrated optics" 2284-5. **Vortr. Poster - Symp. Materialforsch. 1991, 2nd.** B. Vierkorn-Rudolph, D. Lillack and H.-J. Clar. Forschungszentrum, Jülich, Germany. (1991).3.

Haussühl, S., L. Shi, B. Wang, J. Wang, J. Liebertz, A. Wostrack and C. Fink. (1994). "Physical properties of single crystals of $KTiPO_4$, $K_xRb_{1-x}TiOPO_4$, ($x = 0.85; 0.75$), $KGeOPO_4$ and $KTiOAsO_4$." Crystal Research and Technology. **29** (4) 583-589

Holtom, G. R., R. A. Crowell and X. S. Xie."Non-critically phase-matched femtosecond optical parametric oscillator near 3 microns" 407-409. **Advanced Solid-State Lasers.** T. Y. Fan and B. H. T. Chai. Salt Lake City, 7-10 February 1994.Optical Society of America. (1994).OSA Proceedings.**20**.

Holtom, G. R., R. A. Crowell and L. K. Cheng."Femtosecond OPOs at 3 microns and beyond: design and performance issues related to the crystal properties of KTP and similar materials" 219-225. **Solid State Lasers and Nonlinear Crystals.** G. J. Quarles, L. Esterowitz and L. K. Cheng. San Jose, CA, 5-7 Feb 1995.SPIE. (1995).SPIE Proceedings.**2379**.

Holtom, G. R., R. A. Crowell and L. K. Cheng. (1995). "Femtosecond mid-infrared optical parametric oscillator based on $CsTiOAsO_4$." Optics Lett. **20** (18) 1880-1882

Hu, Z. W., P. A. Thomas, J. Webjorn and G. M. Loiacono. (1996). "Domain

inversion in RbTiOAsO_4 using electric field poling." J. Phys. D: Appl. Phys. **29** 1681-1684

Iradi, T. E."Large-scale hydrothermal growth of KTP and KTA" Advanced Program, p. 128
CLEO '94. Summaries of Papers Presented at the Conference on Lasers and Electro-Optics. Vol.8. 1994 Technical Digest Series. Conference Edition pp. 415-16.
CLEO/IQES'94. Anaheim, CA , 8-13 May 1994.(1994).

Isaenko, L. I., N. A. Pylneva, R. I. Mashkovzhev and V. I. Turikov."Influence of real structure on characteristics of KTA elements" 63-68. **New Materials for Advanced Solid State Lasers.** B. H. T. Chai, S. A. Payne, T. Y. Fan, A. Cassanho and T. H. Allik. Boston, MA 29 Nov-1 Dec 1993.MATERIALS Research Society. (1994).Symposia Proceedings.**329.**

Isaenko, L., A. Merkulov, V. Tyurikov, M. R and S. Gromilov. (1996). "Growth and characterization of $\text{KTi}_{1-x}\text{Zr}_x\text{AsO}_4$ single crystals." J. Crystal Growth. **166** 502-506

Isyanova, Y., G. A. Rines, D. Welford and P. F. Moulton."Tandem OPO source generating 1.5-10 μm wavelengths" 174-176. **OSA Trends in Optics and Photonics on Advanced Solid State Lasers.** S. A. Payne and C. R. Pollock. San Francisco, CA, 31 Jan-2 Feb 1996.OSA. (1996).**1.**

Jacco, J., J. Rottenberg, R. A. Stolzenberger and M. G Loiacono." CsZrOAsO_4 (CZA) and $\text{K}_{1-x}\text{Rb}_x\text{TiOAsO}_4$ (KRTA), New nonlinear materials for laser application in the 2-5 μm region" January 1996.Crystal Associates, Inc., WL-TR-96-4024. (1996).

Jani, M. G., J. T. Murray, R. R. Petrin, R. C. Powell, D. N. Loiacono and G. M. Loiacono. (1992). "Pump wavelength tuning of optical parametric oscillations and frequency mixing in KTiOAsO_4 ." Appl. Phys. Lett. **60** 2327-2329

Ji, W., H. P. Li, F. Zhou and N. Zhai."Picosecond z-scan investigation of two-photon absorption and bound electronic self-focusing in second-harmonic-generation crystals" 414-423. **Electro-Optic and Second Harmonic Generation Materials, Devices, and Applications.** SPIE. (1996).Proc. SPIE-Int. Soc. Opt. Eng.**2897.**

Jones, R. P."Parametric oscillation in KTP and KTA at 1064 nm" 357-364. **Solid State Lasers and Nonlinear Crystals.** G. J. Quarles, L. Esterowitz and L. K. Cheng. San Jose, CA, 5-7 Feb 1995.SPIE. (1995).SPIE Proceedings.**2379**.

Karlsson, H., F. Laurell, P. Hendricksson and G. Arvidsson. (1996). "Frequency doubling in periodically poled RbTiOAsO_4 ." **Electronics Letters.** **32 (6)** 556-557

Katiyar, R., A. R. Guo, Z.-Y. Cheng, R. Guo and A. S. Bhalla."Effect of defects on dielectric properties in KTiOAsO_4 , RbTiOAsO_4 , and CsTiOAsO_4 " Program p.137. **Solid State Chemistry of Inorganic Materials.** P. Davies, A. Jacobson, C. Torardi and T. Vanderah. MRS, Boston, MA, 2-5 Dec 1996.(1996).

Kato, K. (1994). "Second-harmonic and sum-frequency generation in KTiOAsO_4 ." **IEEE J. Quantum Electronics.** **30** 881-883

Kaz, A., R. Burnham, L. R. Marshall and A. Pinto."Non-critically phase-matched, degenerate 4 μm optical parametric oscillator" 443-446. **Advanced Solid-State Lasers.** T. Y. Fan and B. H. T. Fan. Salt Lake City, 7-10 February 1994.Optical Society of America. (1994).OSA Proceedings.**20**.

Kaz, A., L. R. Marshall, A. Pinto and R. Utano."Scaling optical parametric oscillators in power, energy, and beam quality" 466-470. **Advanced Solid-State Lasers.** T. Y. Fan and B. H. T. Chai. Salt Lake City,UT 7-10 February 1994.Optical Society of America. (1994).OSA Proceedings.**20**.

Khodjaoui, A., J. Mangin and G. Marnier. (1994). "Dielectric properties of KTA and secondary optical absorption of KTA and KTP." **Nonlinear Optics.** **7** 53-64 **Mol. Cryst. Liq. Cryst. Sci Technol. B.**

Kikuchi, H., A. A. Godil and T. Fukui."Electro-optical modulator" Sony Corp., Japan. (CA **125:99649** patent).

Kikuchi, H., G. Ashifu and M. Oka."Continuous UV laser apparatus" Sony Corp, Japan. (CA **125:99573**).

Kishimoto, T. and K. Imamura."Flux growth of potassium titanium arsenate single crystals" Sumitomo Metal Mining Co., Ltd., Japan. (CA 114:238198).

Komine, H., J. M. Fukumoto, J. W.H. Long and E. A. Stappaerts."Tunable mid-infrared wavelength converters for neodymium-doped lasers" 87-91. **LEOS '94. Conference Proceedings. IEEE Lasers and Electro-Optics Society 1994 7th Annual Meeting.** Boston, MA, USA, 31 Oct.-3 Nov. 1994.IEEE. (1994).**Proceedings of LEOS'94 ,2 vol. (xx+345+450).**

Komine, H., J. M. Fukumoto, J. W.H. Long and E. A. Stappaerts."High-repetition rate infrared OPOs" 269-270. **CLEO'95. Summaries of Papers.** O. S. o. America. Baltimore, MD, 22-26 May 1995.OSA. (1995).**1995 Technical Digest Series.15, 1995 Technical Digest Series.**

Kung, A. H. (1994). "Narrowband mid-infrared generation using KTiOAsO_4 ." **Appl. Phys. Lett. 65 (9)** 1082-1084

Kung, A. H."Narrowband mid-infrared generation using KTiOAsO_4 " 163-169. **Solid State Lasers and Nonlinear Crystals.** G. J. Quarles, L. Esterwitz and L. K. Cheng. San Jose, CA., 5-7 Feb. 1995.SPIE. (1995).**2379.**

Kung, A. H. (1995). "Efficient conversion of high-power narrow-band Ti:sapphire laser radiation to the mid-infrared in KTiOAsO_4 ." **Optics Lett. 20 (10)** 1107-1109

Kung, A. H."Efficient generation of tunable narrowband mid-infrared radiation in KTiOAsO_4 " 334-6/WG1-1-3. **Advanced Solid State Lasers - Technical Digest.** O. S. o. America. Memphis, TN , 30 Jan.-2 Feb. 1995.OSA. (1995).**Technical Digest.**

Kung, A. H."Experimental issues of tunable narrowband mid-infrared generation in KTiOAsO_4 " 375-378. **Advanced Solid State Lasers.** B. H. T. Chai and S. A. Payne. Memphis, TN , 30 Jan.-2 Feb. 1995.Optical Society of America. (1995).OSA Proceedings.**24.**

Kung, A. H., S. Fei and H. L. Strauss. (1996). "Mid-infrared sources using dye lasers in KTiOAsO_4 and LiIO_3 ." **Applied Spectroscopy. 50 (6)** 790-794

Kunz, M., R. Dinnebier, L. K. Cheng, E. M. McCarron, D. E. Cox, J. B. Parise, M. Gehrke, J. Calabrese, P. W. Stephens, T. Vogt and R. Papoular. (1995). "Cs(TiAs)O₅ and Cs(TiP)O₅: A disordered parent structure of ABOCO₄ compounds." *J. Solid State Chemistry.* **120** 299-310

Lai, B., N. C. Wong and L. K. Cheng. (1995). "Continuous-wave tunable light source at 1.6 μm by difference-frequency mixing in CsTiOAsO₄." *Optics Lett.* **20** (17) 1779-1781

Lancaster, D. G. and J. M. Dawes. (1995). "A pulsed laser source using stimulated Raman scattering and difference frequency mixing: remote sensing of methane in air." *Optics Comm.* **120** 307-310

Lee, I. and J. Horn."3.5 micron potassium titanyl arsenate optical parametric oscillator" 59. **1995 OSA Annual Meeting.** O. S. o. America. Portland, Oregon, 10-15 September 1995. OSA. (1995). **Program.**

Liu, W. J., S. S. Jiang, X. R. Huang, X. R. Hu, C. Z. Ge, J. Y. Wang, J. H. Jiang and Z. G. Wang. (1996). "White-beam synchrotron topographic characterization of flux-grown KTiOAsO₄." *Appl. Phys. Lett.* **68** (1) 25-27

Loiacono, G. M. and D. N. Loiacono."Synthesis, Crystal Growth and Characterization of CsTiOAsO₄ for OPO Applications to 5 Microns" 6 November 1992.Crystal Associates Inc., WL-TR-92-4103. (1992).

Loiacono, G. M., D. N. Loiacono, J. J. Zola, R. A. Stolzenberger, T. McGee and R. G. Norwood. (1992). "Optical properties and ionic conductivity of KTiOAsO₄ crystals." *Appl. Phys. Lett.* **61** 895-897

Loiacono, G. M., D. N. Loiacono, T. McGee and M. Babb. (1992). "Laser damage formation in KTiOPO₄ and KTiOAsO₄ crystals: Grey tracks." *J. Appl. Phys.* **72** 2705-2712

Loiacono, G. M. and D. N. Loiacono."Improved KTP Crystal Growth" 20 March 1992.Crystal Associates, Inc., WL-TR-92-4007. (1992).

Loiacono, G. M., D. N. Loiacono and R. A. Stolzenberger. (1993). "Crystal growth and characterization of ferroelectric CsTiOAsO₄." *J. Crystal*

Growth. **131** 323-330

Loiacono, G. M. (1994). "Comment on "Nonlinear optical and electro-optical properties of single crystal CsTiOAsO_4 " [Appl. Phys. Lett. **63**, 2613 (1993)]." Appl. Phys. Lett. **64** 2457

Loiacono, G. M., D. N. Loiacono, R. A. Stolzenberger and J. Rottenberg."Improved NLO Material to 5 Microns: Growth of CTA, RTA and Mixed Crystals" 27 September 1995.Crystal Associates, Inc., WL-TR-96-4012. (1996).

Mangin, J., G. Marnier, B. Boulanger and B. Menaert."New non-linear optical materials of the KTiOPO_4 family" 65-68. **International Conference on Materials for Non-linear and Electro-optics.** Cambridge.Institute of Physics, Bristol. (1989).Institute of Physics Conference Series.**103:Part 1.**

Marnier, G., B. Boulanger, M. Metzger and B. M. P. Menaert."Melt-solution synthesis of crystals and epitaxial layers of solid solutions of potassium titanyl phosphate isotypes" German patent.Ger. Offen. DE 3,801,862 (Cl. C30B9/00). 04 Aug 1988. (1988).

Marnier, G., B. Boulanger and B. Menaert. (1989). "Ferroelectric transition and melting temperatures of new compounds: CsTiOAsO_4 and $\text{Cs}_x\text{M}_{1-x}\text{TiOAs}_y\text{P}_{1-y}\text{O}_4$ with M = K or Rb." J. Phys.:Condensed Matter. **1** 5509-5513

Marshall, L. R."CW-pumped nonlinear converters" 401. **CLEO'95. Summaries of Papers.** O. S. o. America. Baltimore, MD, 22-26 May 1995.OSA. (1995).**1995 Technical Digest Series.15, 1995 Technical Digest Series.**

Marshall, L. R."Mid-infrared CW & pulsed optical parametric oscillators" 55. **OSA Annual Meeting.** O. S. o. America. Portland, Oregon, 10-15 September 1995.OSA. (1995).**Program.**

Marshall, L. R."Efficient multiwatt 2-5 μm tunable sources" 368-369 Advance Program p. 128. **CLEO/QELS '96.** O. S. o. America. Anaheim, CA, 2-7 June 1996.OSA. (1996).**1996 Technical Digest Series.9.**

Marshall, L. R., J. Earl and A. Johnson."Efficient 2-5 μm KTP, KTA and ZnGeP₂ OPOs" 171-173. **OSA Trends in Optics and Photonics on Advanced Solid State Lasers.** S. A. Payne and C. R. Pollock. San Francisco, CA, 31 Jan-2 Feb 1996.OSA. (1996).1.

Mashkovtsev, R. I. and L. I. Isaenko. (1995). "Radiation-induced holelike centers in KTiOAsO₄." **Solid State Comm.** **95 (10)** 739-743

Mashkovtsev, R. I. and L. I. Isaenko. (1996). "Spectroscopic study of KTiOAsO₄ single crystals." **Physica Status Solidi b.** **198** 577-585

Mayo, S. C., P. A. Thomas, S. J. Teat, G. M. Loiacono and D. A. Loiacono. (1994). "Structure and non-linear optical properties of KTiOAsO₄." **Acta Cryst. B50 (6)** 655-662

McGowan, C., D. T. Ried, M. Ebrahimzadeh and W. Sibbett."Mid-infrared femtosecond pulses from a critically phase-matched optical parametric oscillator based on KTiOAsO₄" 342, Advance program p. 124.

CLEO/QELS'96. O. S. o. America. Anaheim, CA. 2-7 June 1996.OSA. (1996).1996 Technical Digest series.9.

McGowan, C., D. T. Ried, M. Ebrahimzadeh and W. Sibbett. (1996). "Continuously tunable femtosecond pulses covering 2.1-2.5 μm from an optical parametric oscillator based on RbTiOAsO₄." **J. Modern Optics.** **43(5)** 913-918

Miyake, C. I., D. Lowenthal, J. Seamans and M. Bowers."High Repetition Rate Mid-infrared Laser for IRCM" January 1995.Aculite Corp., Bellevue, WA. (1995).

Mohamadou, B., G. E. Kugel and G. Marnier. (1992). "Raman spectra in non-linear A_{1-x}B_xTiOAsO₄ mixed single crystal (A,B=K,Rb,Cs)." **Ferroelectrics.** **125** 379-383

Morris, P. A., A. Ferretti, J. D. Bierlein and G. M. Loiacono. (1991). "Reduction of the ionic conductivity of flux grown KTiOPO₄ crystals." **Journal of Crystal Growth.** **109** 367-75

Morris, P. A. "Defect chemistry of nonlinear optical oxide crystals". 380-393. Materials for Nonlinear Optics : Chemical Perspectives.**455**. S. R. Marder, J. E. Sohn and G. D. Stucky. American Chemical Society.Washington D.C. (1991). ACS Symposium Series.Report Morris, P. A."Defect chemistry of nonlinear optical oxide crystals".1991.Report number.

Murray, J. T., N. Peyghambarian and R. C. Powell. (1994). "Near infrared optical parametric oscillators." Optical Materials. **4(1)** 55-60

Nelson, D. F."Low Frequency Properties of Dielectric Crystals" 543. **Landolt-Börstein, New Series, Group III: Solid State Physics.** O. Madelung. Berlin.Springer-Verlag. (1993).III/29b.

Nelson, M., V. Dominic and T. P. Grayson."Synchronously pumped optical parametric oscillators using KTA: Experimental vs. numerical calculations" Paper CG-8. **The Ohio Section/American Physical Society.** Univ. of Dayton, Dayton, Ohio, 6-7 Oct 1995.(1995).

Nelson, M. D., B. D. Duncan and T. P. Grayson."Oscillation threshold calculations for synchronously pumped optical parametric oscillators" 59. **OSA Annual Meeting.** O. S. o. America. Portland, Oregon, 10-15 September 1995.OSA. (1995).**Program**.

Neuman, W. A. and S. P. Velsko."Optical parametric oscillator performance at high average power" 268-269. **CLEO/QELS '96.** O. S. o. America. Anaheim, CA, 2-7 June 1996.OSA. (1996).1996 Technical Digest Series.**9**.

Northrup, P. A., J. B. Parise, L. K. Cheng and E. M. McCarron. (1994). "High-temperature single-crystal x-ray diffraction studies of potassium and (Cesium, potassium) titanyl arsenates." Chemistry of Materials. **6** 434-440

Ohayashi, Y."Poling of optical crystals" Hamamatsu Photonics K. K., Japan. (CA **116:13797** patent).

Pagnoux, C., D. Guyomard, A. Verbaere, Y. Piffard and M. Tournoux. (1991). "Nouveaux composes de l'antimoine isotypes de $KTiOPO_4$ " New antimony isomorphous derivatives of $KTiOPO_4$." Comptes Rendus de l'Academie des Sciences, Serie II. **312 (6)** 611-615

Pfister, O., M. Murtz, J. Wells and L. Hollberg."Division by three of optical frequencies using noncritically phase-matched RTA" 279 Advance Program p.107. **CLEO/QELS '96**. O. S. o. America. Anaheim, CA, 2-7 June 1996.OSA. (1996).1996 Technical Digest Series.**9**.

Pfister, O., M. Mürtz, J. S. Wells, L. Hollberg and J. T. Murray. (1996). "Division by 3 of optical frequencies by use of difference-frequency generation in noncritically phase-matched RbTiOAsO_4 ." **Optics Lett.** **21** (17) 1387-1389

Phillips, M. L. F., W. T. A. Harrison, T. E. Gier and G. D. Stucky."SHG tuning in the KTP structure field" 225-231. **Growth, Characterization, and Applications of Laser Host and Nonlinear Crystals**. J. T. Lin. Orlando, Florida, 27-28 March 1989.SPIE. (1989).SPIE Proceedings.**1104**.

Phillips, M. L. F., W. T. A. Harrison and G. D. Stucky."Nonlinear optical properties of new KTiOPO_4 isostructures" 84-92. **Inorganic Crystals for Optics, Electro-Optics, and Frequency Conversion**. P. F. Bordui. San Diego, CA, 25 July 1991.SPIE, Bellingham, WA. (1991).**1561**.

Phillips, M. L. F., M. T. Anderson and M. B. Sinclair."Optical properties of lanthanide-doped RbTiOAsO_4 and transition metal-doped KTiOPO_4 " 733-40. **Proc. 16th International Conf. Lasers'93**. V. J. Corcoran and T. A. Goldman. Lake Tahoe, NV, 6-9 December 1993.STS Press, McLean, VA. (1993).

Phillips, M. L. and G. D. Stucky. (1995). "Hydrothermal synthesis and crystal growth of potassium titanyl arsenate, KTiOAsO_4 ." **Inorganic Syntheses. 30 (Nonmolecular Solids)** 143-146

Powers, P. E., S. Ramakrishna, C. L. Tang and L. K. Cheng. (1993). "Optical parametric oscillation with KTiOAsO_4 ." **Optics Letters.** **18** 1171-1173

Powers, R. E., R. J. Ellingson, W. S. Pelouch and C. L. Tang. (1993). "Recent advances of the Ti:sapphire-pumped high-repetition-rate femtosecond optical parametric oscillator." **J. Opt. Soc. Am. B.** **10** 2162-2167

Powers, P. E., C. L. Tang and L. K. Cheng. (1994). "High-repetition-rate

femtosecond optical parametric oscillator based on CsTiOAsO_4 ." Optics Letters. **19** 37-39

Powers, P. E., C. L. Tang and L. K. Cheng."High-repetition-rate femtosecond OPO using RbTiOAsO_4 " Advance Program, p. 97; 251. **CLEO'94, Summaries of papers presented ay the Conference on Lasers and Electro-Optics.** O. S. o. America. Anaheim, CA 8-13 May 1994.(1994).1994 Technical Digest Series.**8**.

Powers, P. E., C. L. Tang and L. K. Cheng. (1994). "High-repetition-rate femtosecond optical parametric oscillator based on RbTiOAsO_4 ." Optics Lett. **19 (18)** 1439-1441

Powers, P. E."New crystals and new wavelength ranges for ultrafast optical parametric oscillators" Cornell. (1995).

Powers, P. E., L. K. Cheng, W. S. Pelouch and C. L. Tang."Optical parametric oscillation using KTA nonlinear crystals" Cornell Research Foundation, Inc., USA. (CA **122:200716** patent).

Prasad, N. S. and A. R. Geiger."Neodymium-doped potassium titanyl arsenate (Nd:KTA): a new nonlinear optical material" 105. **QELS'95, Summaries of Papers.** O. S. o. America. Baltimore, MD, 22-26 May 1995.OSA. (1995).**16, 1995 Technical Digest Series.**

Protas, P. J., G. Marnier, B. Boulanger and B. Menaert. (1989). "Structure cristalline de CsTiO(AsO_4). Acta Cryst. **C45** 1123-1125

Rahlf, C., Y. Tang, W. Sibbett and M. H. Dunn."High-repetition-rate, mid-infrared KTA-OPO at $3.44 \mu\text{m}$ " 267-268 Advance Program p106. **CLEO/QELS '96.** O. S. o. America. Anaheim, CA, 2-7 June 1996.OSA. (1996).1996 Technical Digest Series.**9**.

Ramabadran, U. B., D. L. Fenimore, D. E. Zelmon, D. Small, P. vonRichter and K. L. Schepler."Improved phase matching predictions based upon mid-ir dispersion data for rubidium titanyl arsenate (RTA)" 105. **OSA Annual Meeting.** O. S. o. America. Portland, Oregon, 10-15 September 1995.OSA. (1995).**Program.**

Rangan, K. K., B. R. Prasad, C. K. Subramanian and J. Goplakrishnan. (1993). "Coupled substitution of niobium and silicon in KTiOPO_4 and KTiOAsO_4 . Synthesis and nonlinear optical properties of $\text{KTi}_{1-x}\text{Nb}_x\text{OX}_{1-x}\text{Si}_x\text{O}_4$ ($X = \text{P}$, As)."*Inorganic Chemistry.* **32** 4291-4293

Reid, D. T., M. Ebrahimzadeh and W. Sibbett. (1995). "Critically phase-matched Ti:sapphire-pumped femtosecond optical parametric oscillator based on RbTiOAsO_4 ."*Optics Lett.* **20** (1) 55-57

Reid, D. T., M. Ebrahimzadeh and W. Sibbett."Non-critically phase-matched Ti:sapphire-pumped optical parametric oscillator based on RbTiOAsO_4 " 168-170

TuC5-1-3. Technical Digest- Advanced Solid State Lasers. O. S. o. America. Memphis, TN , 30 Jan.-2 Feb 1995. OSA. (1995).

Reid, D. T., M. Ebrahimzadeh and W. Sibbett."Intercavity-frequency-doubled femtosecond OPO based on noncritically- phase-matched RbTiOAsO_4 " 156.

CLEO'95, Summaries of Papers. O. S. o. America. Baltimore, MD, 22-26 May 1995. OSA. (1995).**15, 1995 Technical Digest Series.**

Reid, D. T., M. Ebrahimzadeh and W. Sibbett. (1995). "Efficient femtosecond pulse generation in the visible in a frequency-doubled optical parametric oscillator based on RbTiOAsO_4 ."*J. Opt. Soc. Am. B.* **12** (6) 1157-1163

Reid, D. T., M. Ebrahimzadeh and W. Sibbett. (1995). "Noncritically phase-matched Ti:sapphire-pumped femtosecond optical parametric oscillator based on RbTiOAsO_4 ."*Optics Letters.* **20** (1) 55-57

Reid, D. T., M. Ebrahimzadeh and W. Sibbett. (1995). "Ti:sapphire-pumped femtosecond optical parametric oscillators based on KTiOPO_4 and RTiOAsO_4 ."*Appl. Phys. B.* **60**(5) 437-442

Reid, D. T., M. Ebrahimzadeh and W. Sibbett. (1995). "Design criteria and comparison of femtosecond optical parametric oscillators based on KTiOPO_4 and RbTiOAsO_4 ."*J. Opt. Soc. Am. B.* **12** (11) 2168-2179

Reid, D. T., M. Ebrahimzadeh and W. Sibbett."Non-critically phase-matched Ti:Sapphire-pumped femtosecond OPO based on RbTiOAsO_4 " 180-183.

Advanced Solid-State Lasers. B. H. T. Chai and S. A. Payne. Memphis. TN, 30 Jan.-2 Feb. 1995.Optical Society of America, Washington, D. C. (1995).**24.**

Risk, W. P. and G. M. Loiacono."Fabrication of waveguides in potassium titanyl arsenate by ion exchange" 461-462
Advance Program p. 143. **CLEO/QELS '96.** O. S. o. America. Anaheim, CA, 2-7 June 1996.OSA. (1996).1996 Technical Digest series.**9.**

Risk, W. P. and G. M. Loiacono."Second harmonic generation in a periodically-poled RbTiOAsO₄ waveguide" CPD17-1-3. **CLEO/QELS'96.** O. s. o. America. Anaheim, CA, 2-7 June 1996.OSA. (1996).1996 Technical Digest Series.**9.**

Risk, W. P. and G. M. Loiacono. (1996). "Periodic poling and waveguide frequency doubling in RbTiOAsO₄." Appl. Phys. Lett. **69** (3) 311-313

Scheidt, M., B. Beier, K.-J. Boller and R. Wallenstein."Frequency-stable operation of cw RTA optical parametric oscillators" 341-342.
CLEO/QELS'96. O. S. o. America. Anaheim, CA, 2-7 June 1996.OSA. (1996).1996 Technical Digest Series.**9.**

Scripsick, M. P., G. M. Loiacono and D. L. Loiacono."Improved growth of KTP and KTA crystals" WL-TR-95-4029, March 1995.Crystal Associates, Inc., Waldwick, NJ. (1995).

Sorokina, N., D. Y. Lee, I. A. Verin, V. I. Simonov, V. I. Voronlova and V. K. Yanovsky."Synthesis, properties and crystal structures of some new solid solutions in the systems KTiOPO₄-TITiOPO₄, RbTiOPO₄-TITiOPO₄ and KTiOPO₄-KGeOPO₄" 197-203. **ICONO'95: Nonlinear Optics of Low-Dimensional Structures and New Materials.** V. I. Emel'yanov and V. Y. Panchenko. St. Petersburg, Russia, 27 June-1 July 1995.SPIE. (1995).**2801.**

Spence, D. E. and C. L. Tang. (1995). "Characterization and applications of high repetition rate, broadly tunable, femtosecond parametric oscillators." IEEE J. of Selected Topics in Quantum Electronics. **1** (1) 31-43

Stamm, U. (1995 March). "OPOs advance in Europe, but challenges remain." *Photonics Spectra*. **29** (3) 110-112,114,116

Stolzenberger, R. A., D. N. Loiacono and J. Rottenberg."Electro-optic modulators of KTiOAsO_4 and RbTiOAsO_4 " Advanced Program, p. 128; 415. **CLEO'94, Summaries of papers presented ay the Conference on Lasers and Electro-Optics.** O. S. o. America. Anaheim, CA 8-13 May 1993.OSA. (1994).1994 Technical Digest Series.8.

Stucky, G. D., M. L. F. Phillips and T. E. Gier. (1989). "The potassium titanyl phosphate structure field: A model for new nonlinear optical materials." *Chemistry of Materials*. **1** 492-509

Tang, C. L."Growth, characterization and applications of beta-barium borate and related crystals" Gov. Rep. Announce. Index (U. S.) 1994, 94(20), Abstr. No. 455,238.Cornell Univ., Ithaca, NY. (1993).

Tang, C. L., P. E. Powers and R. J. Ellington. (1994). "Optical parametric processes and broadly tunable femtosecond sources." *Appl. Phys. B*. **58** (3) 243-248

Tang, C. L. "Femtosecond laser studies of ultrafast processes in compound semiconductors". 6, 23-31. Femtosecond Carrier Processes in Compound Semiconductors and Real Time Signal Processing Annual Report: Joint Services Electronics Program Contract #F49620-93-C-0016 1 May 1993-30 April 1994.J. P. Krusius. Cornell University, School of EE.Ithaca, New York. (1994). Report
Tang, C. L."Femtosecond laser studies of ultrafast processes in compound semiconductors".1994.Report number.

Tang, C. L. (1994). "Optical parametric processes and broadly tunable femtosecond sources." *International Journal of Nonlinear Optical Physics*. **3** (2) 205-244

Tang, C. L., D. E. Spence, K. C. Burr and S. Wie. (1995). "Femtosecond optical parametric generators are broadly tunable." *Laser Focus World*. **31** (3) 67-70, 72

Tang, C. L. and L. K. Cheng. (1995). **Fundamentals of Optical Parametric Processes and Oscillators.**130pp. V. S. Letokhov, C. V.

Shank, Y. R. Shen and H. Walther. *Laser Science and Technology*. **20**. Harwood Academic Publishers. Amsterdam.

Thomas, P. A., A. M. Glazer and B. E. Watts. (1990). "Crystal structure and nonlinear optical properties of KSnOPO₄ and their comparison with KTiOPO₄." *Acta Cryst.* **B46** 333-343

Thomas, P. A., S. C. Mayo and B. E. Watts. (1992). "Crystal structures of RbTiOAsO₄, KTiO(P_{0.58},As_{0.42})O₄, RbTiOPO₄ and (Rb_{0.465},K_{0.535})TiOPO₄, and analysis of pseudosymmetry in crystals of the KTiOPO₄ family." *Acta Cryst.* **B48 (4)** 401-407

Tu, C.-S., A. R. Guo, R. Tao, R. S. Katiyar, R. Guo and A. S. Bhalla. (1996). "Temperature dependent Raman scattering in KTiOPO₄ and KTiOAsO₄ single crystals." *J. Appl. Phys.* **79 (6)** 3235-3240

Wang, J., J. Wei, Y. Liu, L. Shi, M. Jiang, X. Hu and S. Jiang. "The growth and properties of some KTP family crystals" 10-16. **Electro-Optic and Second Harmonic Generation Materials, Devices, and Applications**. SPIE. (1996). Proc. SPIE-Int. Soc. Opt. Eng. **2897**.

Watabe, K., K. Hanyu, T. Okamoto and T. Watanabe. "Top seeded solution growth of crystal for nonlinear optical material" Sony Corp, Japan. (CA **120**:231415 patent).

Watson, G. H. (1991). "Polarized Raman spectra of KTiOAsO₄ and isomorphic nonlinear-optical crystals." *J. Raman Spectroscopy*. **22** 705-713

Wei, J., J. Wang, Y. Liu, L. Shi, M. Wang and Z. Shao. (1994). "Growth, second harmonic and sum frequency generation operations of potassium titanyl arsenate crystal." *Chinese Physics Letters*. **11 (2)** 95-98

Womersley, M. N. and P. A. Thomas. (1996). "A new Kosters prism interferometer for simultaneous determination of refractive index and thermal expansion of crystals as a function of temperature." *J. Appl. Crystallogr.* **29(5)** 574-583

Zhong, Z., P. K. Gallagher, D. L. Loiacono and G. M. Loiacono. (1994). "The

thermal expansion and stability of KTiOAsO_4 and related compounds."

Thermochimica Acta. **234(1-2)** 255-261

Zhou, X. and X. Xu. (1996). "A simple and convenient system for an optical method for crystal orientation." Cryst. Res. Technol. **31(1)** K9-K10

Zumsteg, F. C., J. D. Bierlein and T. E. Gier. (1976). " $\text{K}_x\text{Rb}_{1-x}\text{TiOPO}_4$: A new nonlinear optical material." J. Appl. Phys. **47** 4980-4985